



A MACROECONOMETRIC ANALYSIS OF SOUTH AFRICA'S POST-LIBERALISATION CAPITAL INFLOW COMPONENTS

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Declaration

I declare that this thesis is my own, unaided work and is being submitted to the Graduate School of Business at the University of Cape Town in fulfilment of the requirements for the degree of Doctor of Philosophy. This thesis has not been submitted before or for any other examination at any other University.

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26 November 2011

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Abstract

In common with emerging countries in Asia and Latin America, South Africa received substantial capital inflows following socio-political and financial liberalisation in the mid-1990s. However, unlike many other emerging countries, the bulk of South Africa's post-liberalisation inflows have been in the traditionally short-term forms of portfolio and other investment. Hence, in this thesis, a macroeconometric analysis of South Africa's post-liberalisation capital flow components is conducted to investigate the extent to which their divergent impacts have complicated, or even rendered impotent, the dual policy goals of attracting capital inflows on the one hand, while mitigating any significant detrimental impacts on the other.

The results of the analysis show that foreign direct investment is responsive to domestic factors, while portfolio and other flows respond to a combination of domestic and foreign factors. However, domestic business cycle fluctuations are found to have a greater effect on the capital outflows than the capital inflows, and are thus associated with heightened capital flight and repatriation during expansionary phases. Although the capital flow components are found to have varied effects on South Africa's macroeconomy, transmission mechanisms, nominal Rand/U.S. Dollar exchange rate, and economic growth dynamics, the 'hot' flows are found to demonstrate greater boom-bust characteristics compared to foreign direct investment. Conventional economic theory posits that the destabilising effects can be controlled using fiscal and monetary policy mechanisms. However, analysis of the cyclical relationships between the capital flows and fiscal policy finds that net direct investment and net other investment tend to be counter-cyclically associated with fiscal policy, while net portfolio investment tends to be acyclical, indicating that the bulk of South Africa's net capital inflows do not have a significant cyclical relationship with fiscal policy. In addition, net direct investment and net other investment are found to have inconsistent cyclical relationships with monetary policy, while net portfolio investment tends to be procyclical.

Thus, this research finds that although South Africa has been able to use exchange rate flexibility and sterilisation to neutralise the early stages of capital inflows, the divergent characteristics of the country's post-liberalisation capital flow components have limited the fiscal and monetary policy options available to mitigate the detrimental capital flow effects arising from structural factors.

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List of Acronyms

ADF	Augmented Dickey-Fuller unit root test
AIC	Akaike information criteria
ALBI	South African All-Bond Index
ALSI	South African All-Share Index
AR	Autoregressive
ARMA	Autoregressive moving-average
ARIMA	Autoregressive integrated moving-average
ASEAN	Association of South East Asian Nations comprising Indonesia, Malaysia, the Philippines, Singapore, and Thailand
BD	Budget deficit
BK	Baxter-King
CA	Current account
CE	Cointegrating equation
CF	Christiano-Fitzgerald
CPI	Consumer price inflation
CV	Critical value
DGP	Data generating process
DIA	Direct investment Assets
DIL	Direct investment liabilities
ELG	Export-led growth
FDI	Foreign direct investment
G7	Grouping of the seven industrialised countries consisting of France, Germany, Italy, Japan, the United Kingdom, and the United States
GDP	Gross domestic product
GEAR	South African Government's Growth, Employment and Redistribution programme
GFCF	Gross fixed capital formation
GMM	Generalised Method of Moments
HCE	Household consumption expenditure
HP	Hodrick-Prescott
HQ	Hannan-Quinn information criteria
iid	Independent and identically distributed
ILG	Import-led growth
JSE	Johannesburg Stock Exchange
KPSS	Kwaitkowski-Phillips-Schmidt-Shin unit root test
LM-STAT	Legrange multiplier statistic
NDI	Net direct investment
NPI	Net portfolio investment
NOI	Net other investment
NPB	Net purchase of bonds
NPS	Net purchase of shares
OECD	Organisation for Economic Co-operation and Development

OIA	Other investment assets
OIL	Other investment liabilities
OLS	Ordinary least squares
PIA	Portfolio investment assets
PIL	Portfolio investment liabilities
PP	Philips-Perron unit root test
R	Rands
RGDP	Real gross domestic product
SIC	Schwartz information criteria
S&P 500	Standard and Poor's stock market index
SVAR	Structural vector autoregression
Tbill	Treasury bill rate
TYDL	Toda-Yamamoto-Dolado-Lutkepohl
UC	Unobserved components
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
US	United States of America
VAR	Vector autoregression
VECM	Vector error correction model

List of Key Terms

Acyclical	Where two economic factors do not share a cyclical relationship and thus have an insignificant correlation coefficient.
Asset price bubbles	Where asset prices increase excessively because speculators believe that prices will be higher in the future. The resultant price increases become self-reinforcing until collapsing.
Boom-bust cycle	An economic cycle characterised by alternating periods of rapid economic activity and growth followed by a rapid contraction.
Business cycle	Movement of an economy from growth to recession and back again.
Capital flow-led growth	The hypothesis that economic growth can be increased by supplementing domestic savings with foreign capital inflows.
Capital inflows	The flow of capital from a source country into a recipient country.
Capital outflows	The flow of capital for real or financial investment abroad.
Contractionary fiscal policy	Government policy that reduces government spending or increases taxes to generate a reduction in aggregate demand.
Contractionary monetary policy	Government policy that increases interest rates or reduces the size of the money supply.
Contractionary phase	A downward phase of the business cycle that comes after an expansionary phase and before a recession.
Counter-cyclical	Where two economic factors share an inverse cyclical relationship and thus have a negative correlation.
Counter-cyclical policy	An economic policy that follows the inverse of the business cycle and thus seeks to slow the economy during upswings and stimulate the economy during downturns.
Currency appreciation (depreciation)	An increase (decrease) in the value of a country's currency with respect to one or more foreign currencies.

Current account	The difference between a country's exports and imports of goods, services, and interest payments.
Dutch disease	The decline in some of a country's export and import-competing sectors when there is a boom in the country's natural resource exports or a surge of capital inflows.
Expansionary fiscal policy	An increase in government spending or tax reduction aimed at expanding aggregate demand.
Expansionary monetary policy	Monetary policy that reduces interest rates or increases the size of the money supply in order to depreciate the currency.
Expansionary phase	The upward phase of the business cycle when economic activity surges and GDP expands.
Export-led growth	The hypothesis that a country can achieve a higher rate of economic growth through the export of manufactured goods.
Fiscal policy	A government's use of taxation and government spending to influence the economy.
Floating exchange rate	An exchange rate regime where a country's currency value is determined by the supply and demand for its currency in the foreign exchange market.
Foreign direct investment	A form of capital flow that consists of fixed investment or investment in a firm where the foreign investors control at least 10 percent of the voting rights.
Greenfield investment	A form of FDI where a parent company starts a new venture in a foreign country by constructing new operational facilities from the ground up.
Hot money	Short-term speculative capital flows between financial markets in different countries or regions.
Import-led growth	The hypothesis that a country can achieve a higher rate of economic growth through the import of goods and services.
Liberalisation	Changes in government policies towards a free-market economy, which commonly involve reducing controls on internal and international transactions, and using a price

	mechanism (such as inflation targeting) to coordinate economic activities.
Monetary policy	A policy pursued by a government or its central bank/monetary authority to manage the supply of money or interest rates in order to achieve specific macroeconomic goals.
Other investment	A form of short-term capital flow that includes foreign loans and deposits between banks, companies and governments.
Portfolio investment	A form of capital flow that includes the purchase and sale by foreigners of bonds and equities listed on domestic and international capital markets.
Procyclical	Where two economic factors share a positive cyclical relationship and thus have a positive correlation coefficient.
Procyclical policy	An economic policy that follows the business cycle and thus tends to increase during upswings and decrease during downturns.
Pull factor	Economic developments in recipient countries that attract (pull) capital flows from source countries.
Push factor	Economic developments in source countries that drive (push) capital flows to recipient countries.
Reserves	Accumulated holdings by central banks/monetary authorities of foreign financial assets commonly consisting of foreign currency, bonds, and gold.
Shock	A sudden and unexpected event (usually negative) that can cause a significant change in a country's economy.
Speculation	The practice of buying assets with a higher risk in order to gain from short-term price changes.
Sterilisation	A monetary policy intervention in the domestic money market with the aim of restoring the monetary base to its original size.
Transmission mechanism	The channels by which changes in supply and demand are transmitted through the economy.

Dedicated to Yolanda and Sam

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

According to the Washington Consensus, neo-liberal reforms in developing countries were expected to produce increased long-term investment and stability via the benefits associated with global capital flows. However, in the wake of the numerous emerging market crises in the 1990's, the evidence suggests that financial liberalisation has instead been accompanied by heightened capital flow volatility and economic instability (Demir, 2009; Fitzgerald, 2001; Weller, 2001, Steinheer, 2000).

Hence, the extents to which the benefits of capital flows outweigh the potentially detrimental impacts are a source of on-going debate. On the one hand, it is argued that capital inflows benefit recipient countries through heightened domestic investment, financial sector development, improved liquidity, and international integration (Kim and Yang, 2008), while offering source countries fresh opportunities for investment growth and risk mitigation through international diversification (Contessi *et al.*, 2008).

On the other hand, studies of the impacts of capital flows in Latin America and Asia have shown that post-liberalisation inflows can swamp the recipient country's financial system, stimulating excessive credit extension, consumption booms, and asset price bubbles; as well as resulting in macroeconomic side-effects such as inflationary pressure, real exchange rate appreciation, widening current account deficits, and heightened financial instability.

Furthermore, in an increasingly globalised world, international trade and financial linkages have resulted in macroeconomic spillovers coupled with the synchronisation of business cycles (Kose *et al.*, 2003 and 2008). These developments in turn, have implications for global capital flows. During an expansionary phase in source countries, changes in interest rates and heightened economic growth typically 'push' capital to recipient countries (Calvo *et al.*, 1993 and 1996; Fernandez-Arias, 1996; Chohan *et al.*, 1998). This capital is then 'pulled' into the recipient countries that can offer better returns and investment opportunities depending on country-specific factors such as disciplined fiscal policies (Schadler *et al.*, 1993), openness to trade (Williamson, 1993), good

creditworthiness (Bekaert, 1995), institutional quality (Alfaro *et al.*, 2008), robust private consumption (Calvo and Vegh, 1999), and low country risk premiums (Neumeyer and Perri, 2005).

In contrast, during a contractionary phase, cash flows in source countries will typically shrink and as a result there will be less capital available for outbound investment. In addition, if the downturn occurs in both source and recipient countries, then risk-aversion will increase due to heightened uncertainty and declining returns, which further stimulates capital outflows. Hence capital outflows may be due to the repatriation of foreign investment or domestic investment in search of improved returns abroad (Broner *et al.*, 2011). Consequently, the cyclical relationship between capital flows and the business cycle of recipient countries will tend to be procyclical during expansionary phases but counter-cyclical during contractionary phases, which suggests that the capital flow cycle reinforces rather than stabilises the business cycle (the ‘when-it-rains-it-pours syndrome’ of Kaminsky *et al.*, 2004).

The movements of the business cycle-driven capital flow fluctuations are transmitted to a recipient country’s asset prices in three ways: first, directly, by increasing the demand for assets; second, by increasing money supply and liquidity; and third, by generating economic booms (Kim and Yang, 2009). A fundamental conduit in these dynamics is the recipient country’s banking sector whereby capital inflows are used for credit access rather than for fixed investment, particularly among banks that are under-capitalised or have poor credit assessment oversight as they will have a high moral hazard incentive to undertake risky and excessive credit extension (Sachs and Woo, 2000; Krugman, 1998; Mishkin, 1999; Sarno and Taylor, 1999a; Kaminsky and Reinhart, 1999; Reinhart and Rogoff, 2008; Zhou, 2008). The easier access to credit in turn, leads to debt-fuelled private consumption, fuels stock and property booms and the heightened collateral values further sustain the credit boom (Jansen, 2003). However, in time, domestic credit market inefficiencies increase the ratio of non-performing loans relative to the stock market value, resulting in a loss of investor confidence and a liquidity crisis as boom turns to bust (Dekle and Kletzer, 2001).

The conventional wisdom is that global business cycle fluctuations will impact the short-term capital flow components to a greater degree than foreign direct investment (FDI) due to the shorter investment horizons and higher risk profiles. FDI in contrast, typically involves tangible investment in fixed assets, and thus tends to have a longer investment horizon and is more risk-averse than portfolio and other investment. Hence, FDI is believed to be the least volatile and thus the most desirable capital flow component, while portfolio and other short-term inflows are believed to be the most volatile and thus more likely to require policy interventions (Turner, 1991).

However, the policy instruments available to counteract the detrimental side-effects largely depend on how the capital flows arise. If a recipient country’s inflows are driven primarily by

exogenous (push) factors then policy makers will have little control over the inflows and outflows, whereas if the capital flows are driven primarily by domestic (pull) factors then policy makers can use fiscal and monetary policy mechanisms to control the volatility of the flows and mitigate possible detrimental impacts (de Vita and Kyaw, 2009).

According to the traditional Keynesian and Neo-Classical theories, policies should be counter-cyclical or acyclical respectively (Demirel, 2010). To achieve this, policy makers have traditionally proposed the use of counter-cyclical policies (consisting of tight monetary and fiscal policies coupled with flexible exchange rates), structural policies (consisting of trade liberalisation and regulatory banking supervision), and regulatory measures (controls on capital inflows or capital outflows) (Lopez-Mejia, 1999). However, the adoption of these various policy options in emerging countries has proven problematic due to both policy and country-specific limitations; and consequently, the cyclical relationships between the capital flows and fiscal and monetary policies are more often procyclical than counter-cyclical.

With regard to policy limitations, emerging countries are often unable to build up the budget surpluses and reserves needed to implement counter-cyclical policies, and as a result, are unable to defend their currencies from the large exchange rate effects, nor to mitigate the accompanying macroeconomic instability that accompanies large capital inflows (Eichengreen, 2000). In addition, in many emerging countries, monetary policy is often a substitute for fiscal discipline, which thus constrains monetary policy as the central bank must take cognisance of government's debt management objectives while attempting to maintain price stability (Sims, 2005).

Furthermore, a common explanation for procyclical monetary policy relates to the joint role of exchange rates and inflation targeting. The use of a managed floating exchange rate regime implies that monetary policy is a function of capital movements (Calvo and Reinhart, 2000). Hence, heightened capital inflows will result in exchange rate appreciation, which in turn eases inflationary pressure on prices and leads to a decline in interest rates. However, when the inflows turn to outflows, policy makers will be forced to raise interest rates so as to defend the value of the currency (da Costa e Silva and Compton, 2008).

With regard to country-specific limitations, emerging countries are often unable to run the fiscal deficit required for a counter-cyclical policy stance because of the financial constraints arising from their limited access to international capital during contractionary phases and renewed access to international finance during expansionary phases. Hence, emerging countries will tend to increase spending while they have the opportunity during expansionary phases and be forced to cut spending during contractionary phases (Gavin and Perotti, 1997; Kaminsky *et al.*, 2004; Aizeman *et al.*, 1996; Riascos and Vegh, 2003; da Costa e Silva and Compton, 2008). These cyclical dynamics can also be

further exaggerated by political distortions arising from voter incentives, government misconduct and weak institutions; which favour expanded fiscal expenditure during booms, and contractionary fiscal policy during downturns (Lane and Tornell, 1996 and 1999; Talvi and Vegh, 2000; Alesina and Tabellini, 2005; Diallo, 2009). In addition, many emerging countries are resource-rich and thus tend to suffer from Dutch Disease, whereby governments increase spending through heightened tax revenues and borrowings during commodity booms, but then find it difficult to reduce expenditure when commodity prices decline (Frankel *et al.*, 2007).

Beyond shaping capital flow dynamics and policy responses, global business cycles also impact the demand and supply of exports and imports. This in turn has implications for economic growth because these dynamics affect the drivers of the three commonly cited theories of economic growth: the export-led growth hypothesis, the import-led growth hypotheses, and the capital flow-led growth hypothesis. The export-led growth hypothesis posits that exports of manufactured goods leads to higher economic growth because of the associated externalities and spillover effects (Bhagwati, 1978; Krueger, 1978; Balassa, 1978; Kavoussi, 1984; Ram, 1987). Recent endogenous growth models have argued that economic growth can also be driven by imports of goods and services, which provide firms with access to intermediate factors, foreign technology and knowledge (Grossman and Helpman, 1991; Coe and Helpman, 1995; Lawrence and Weinstein, 1999; Mazumdar, 2002). In contrast, the capital flow-led growth hypothesis posits that the economic growth rate can be increased by supplementing domestic savings with foreign capital inflows (Reisen, 1998; Mody and Murshid, 2005).

FDI enhances economic growth directly from fixed investment, as well as from technological, production, knowledge and organisational spillover effects (De Mello, 1997; Borensztein *et al.*, 1998), while portfolio flows enhance economic growth through heightened savings mobilisation and deployment, financial sector development, risk-sharing, and heightened global liquidity (Bailliu, 2000; Soto, 2000; Reisen and Soto, 2001; Ferreira and Laux, 2009). However, the spillover effects arising from portfolio flows may only be generated once the recipient country has reached a level of development sufficient to attract and absorb FDI (de Vita and Kyaw, 2009). This suggests that even if a country receives substantial portfolio flows, economic growth may not be significantly enhanced because the spillover effects are hampered by a lack of FDI, rendering the country reliant on the exports of manufactured goods as the primary source of economic growth.

Thus in summary, global business cycle dynamics have implications for capital flows to recipient countries whereby capital is pushed to recipient countries that have attractive domestic (pull) policies. Unfortunately, the capital inflows can result in macroeconomic instability and spur heightened credit extension, which in turn leads to debt-fuelled private consumption, and asset price

bubbles. However, the policy options available to recipient countries to counter-act these detrimental impacts largely depend on how the inflows arise (push versus pull driven), as well as on both policy and country-specific limitations. These dynamics in turn have implications for economic growth because the global fluctuations will impact the export and import demands that drive the export and import-led growth hypotheses, as well as the magnitude of capital flows available for the capital flow-led growth hypothesis.

1.2 STYLISTED FACTS ON CAPITAL FLOWS AND SELECTED MACROECONOMIC FACTORS IN SOUTH AFRICA

South Africa has experienced significant capital inflows following the country's political liberalisation in April 1994 and financial liberalisation in March 1995.¹ As can be seen from Figures 1-1(a) – 1-1(c), annual total inflows increased from a negative R2.5 billion in 1985, to a positive R10.1 billion in 1994, tripled to R32.4 billion in 1995, and then ballooned to R196.3 billion in 2007. Table 1-1 further shows that over the pre-liberalisation period from the first quarter of 1985 to the second quarter of 1995, capital inflows totalled just R7.76 billion while outflows totalled R29.25 billion, resulting in a net outflow of R21.49 billion. In contrast, over the post-liberalisation period from the second quarter of 1995 to the end of 2007, the inflows totalled R937.9 billion while outflows totalled R495.4 billion, resulting in a net inflow of R442.5 billion.

However, as can be seen from Table 1-1, unlike in many other emerging countries, the bulk of South Africa's post-liberalisation inflows have been in the traditionally short-term forms of portfolio and other inflows rather than FDI (Ahmed *et al.*, 2007; Arvanitis, 2006). From the second quarter of 1995 through to the end of 2007, the share of FDI was 22% (R206.2 billion) of total inflows while 'hot' inflows made up the remaining 78%, with portfolio inflows comprising 57.2% (R536.9 billion) and other inflows comprising 20.8% (R194.8 billion).

Furthermore, the bulk of South Africa's FDI inflows were generated from a few isolated transactions, most of which have been in the form of mergers and acquisitions (M&A)² rather than 'greenfield' fixed investment (Gelb and Black, 2004). In addition, since 1995, the amount of FDI

¹ When international sanctions were officially ended, the dual exchange rate was unified and exchange controls were relaxed.

² These include the 30% sale of Telkom to a U.S.-Malaysian consortium and the privatisation of Sun Air Corporation in 1997, the Anglo American-De Beers unwinding in 2001, the Barclays Bank-ABSA bank transaction in 2005, and the Standard Bank-Bank of China transaction in 2007 (the significant FDI outflow in 2006 arose when MTN invested \$5.5 billion in INVESTCOM).

outflows by South African firms investing abroad exceeded the amount of FDI inflows (Dube, 2009). Hence, South Africa's ability to attract FDI investment post-1995 has been limited, and thus the economy continues to be reliant on short-term inflows to finance economic development and the current account deficit.

Figure 1-1: South Africa's Capital Flows

Fig. 1-1(a): Foreign Direct Investment

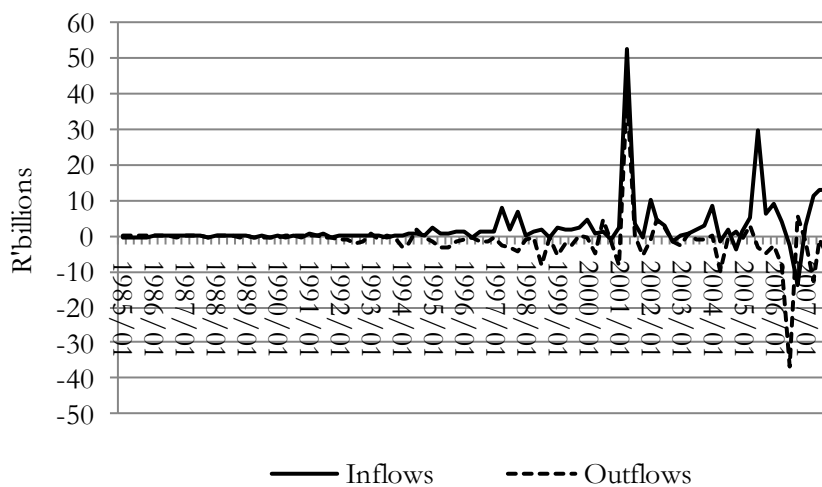


Fig. 1-1(b): Portfolio Investment

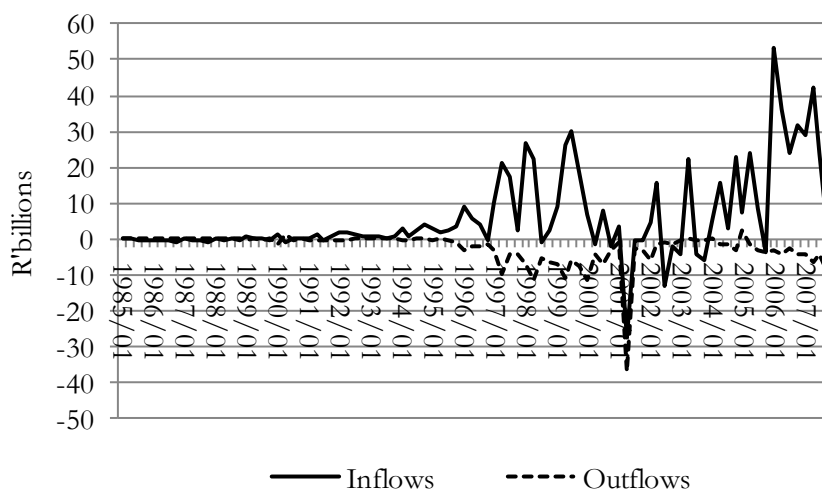


Fig. 1-1(c): Other Investment

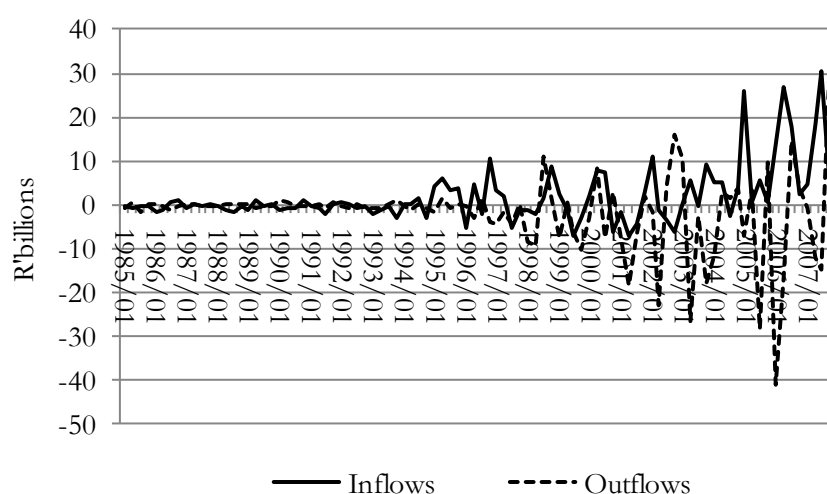


Table 1-1: South Africa's Capital Inflows Before and After Financial Liberalisation

Capital Flows	1985:Q1-1995:Q1		1995:Q2-2007:Q4		1985:Q1-2007:Q4	
	R'billions	% Split	R'billions	% Split	R'billions	% Split
<i>Capital Inflows:</i>						
FDI	2.97	38.3	206.21	22.0	208.72	22.1
Portfolio	19.98	257.6	536.86	57.2	556.84	58.9
Other	-15.19	-195.8	194.84	20.8	179.65	19.0
Total	7.76	100.0	937.91	100.0	945.21	100.0
<i>Capital Outflows:</i>						
FDI	-14.16	48.4	-93.53	18.9	-107.69	20.5
Portfolio	-3.15	10.8	-223.57	45.1	-226.71	43.2
Other	-11.94	40.8	-178.35	36.0	-190.29	36.3
Total	-29.25	100.0	-495.44	100.0	-524.69	100.0
<i>Net Capital Flows:</i>						
FDI	-11.20	52.1	112.69	25.5	101.03	24.0
Portfolio	16.83	-78.3	313.30	70.8	330.13	78.5
Other	-27.13	126.2	16.49	3.7	-10.64	-2.5
Total	-21.49	100.0	442.47	100.0	420.52	100.0

Source: South African Reserve Bank data.

In order to mitigate currency pressures, the central bank has made the building up of reserves a key component of policy formulation (LiPuma and Koelble, 2009). Figure 1-2(a) shows that central bank reserves increased from a 4-quarter average of just 0.6% of real GDP in 1985, to 1.5% in 1995, and to 16.5% in 2007. Over the same period, M2 money supply steadily rose from an average of 7.2% of real GDP in 1985 to 103.4% in 2007. However, despite the robust capital inflows, the

Rand/U.S. Dollar exchange rate steadily depreciated from an average of R2.23 to the dollar in 1985, to R3.63 to the dollar in 1995, and then to R7.05 to the dollar in 2007.

Figures 1-2(a) and (b) further show that post-2003, as the central bank lowered interest rates and accelerated the build-up of reserves, heightened capital inflows stimulated rising credit extension and asset prices. Credit extension increased from an average of 83.7% of real GDP in 2003 to 128.8% of real GDP in 2007. Over this period, share prices and house prices also appreciated rapidly in concert with significant capital inflows. The Johannesburg All-Share Index (ALSI) rose by 59.7%, from a 4-quarter average of 5,540.2 in 1995 to 8,845.9 in 2003, and then ballooned to 28,452.4 in 2007. Similarly, the ABSA medium-sized house price index jumped by 132.7%, from an average of 69.7 in 1995 to 162.3 in 2003, and then grew by a further 125.9% in just four years, reaching 366.3 in 2007. The All-Bond Index (ALBI) in contrast, did not appreciate as drastically, increasing 40.0% over 8 years, from an average of 122.1 in 1995 to 170.9 in 2003, before declining by 1.8% over the next four years, reaching 167.9 in 2007.

Figure 1-2: Selected Macroeconomic Factors

Fig. 1-2(a)

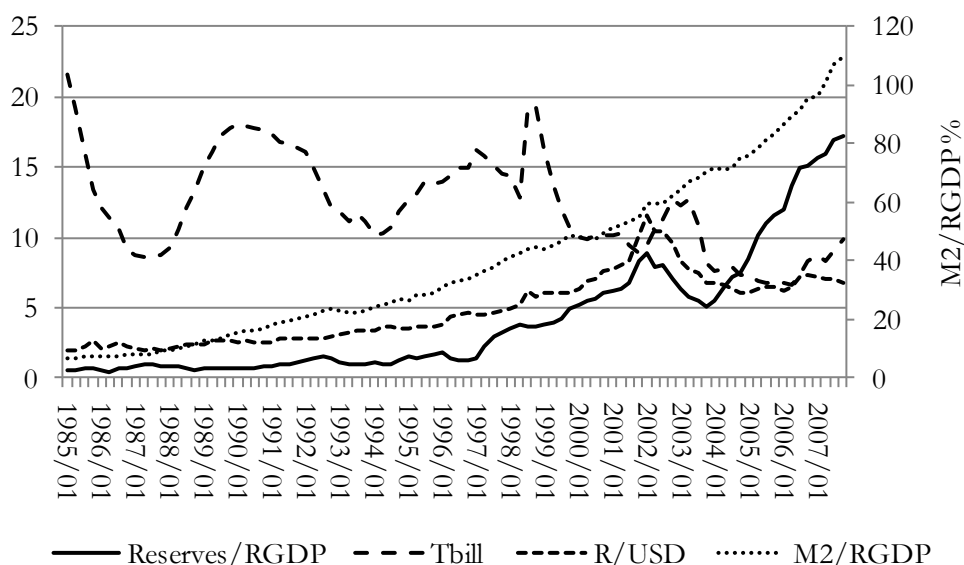
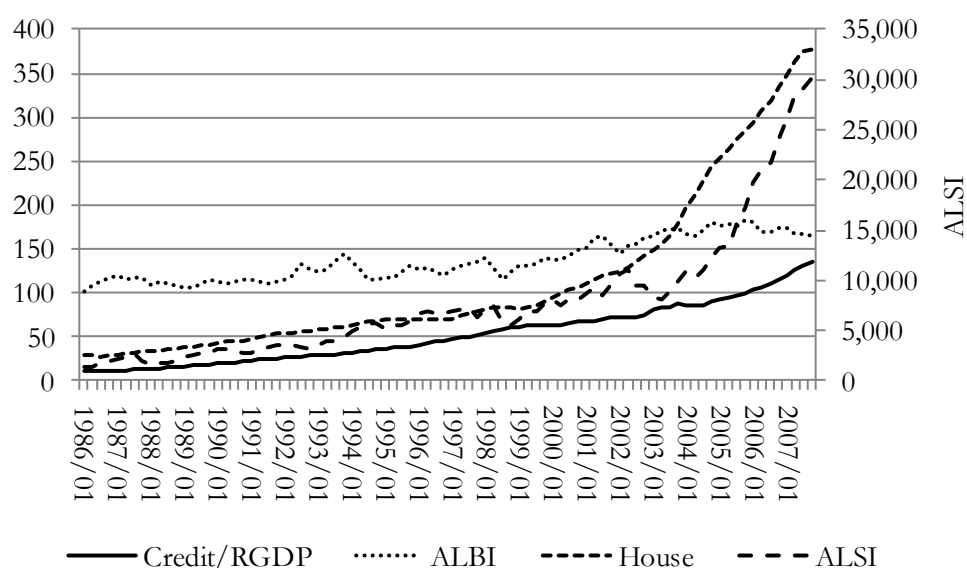


Fig. 1-2(b)



In conjunction with heightened post-liberalisation capital flows and macroeconomic activity, the country's reintegration into the global economy has also driven substantial trade activity. Figure 1-3(a) shows that South Africa's export volumes rose from a 4-quarter average of R201.4 billion in 1985 to R492.6 billion in 2007, while import volumes increased from an average of R146.2 billion to R564.0 billion over the same period. Table 1-2 indicates that over the period from 1985 to the second quarter of 1995, exports exceeded imports by 27.6%, declining to 6.3% from the second quarter of 1995 through 2007. However from 2004 to 2007, imports exceeded exports by 6.9%. In addition, the correlation between the inflows and imports (74.5%) is greater than the correlation between the capital inflows and exports (65.8%), which suggests that the inflows are more closely associated with import consumption than export investment.

Furthermore, Figure 1-3(b) shows that as imports began to exceed exports, the current account deteriorated from a 4.1% surplus in 1985 to a 7.3% deficit in 2007. Domestic savings as a proportion of real GDP steadily decreased from 24.2% in 1985 to 14.1% in 2007, while the budget deficit deteriorated from -2.6% in 1985, to -5.0% in 1995, but then recovered to 0.7% in 2007. Hence, although South Africa's volumes of exported goods increased post-1995, imports overtook exports after 2004 and thus the current account deficit deteriorated as domestic savings weakened. At the same time, the country experienced significant capital inflows, but the bulk has been in portfolio and other short-term flows rather than FDI.

Figure 1-3: Total Capital Inflows and Selected Trade Factors

Fig. 1-3(a)

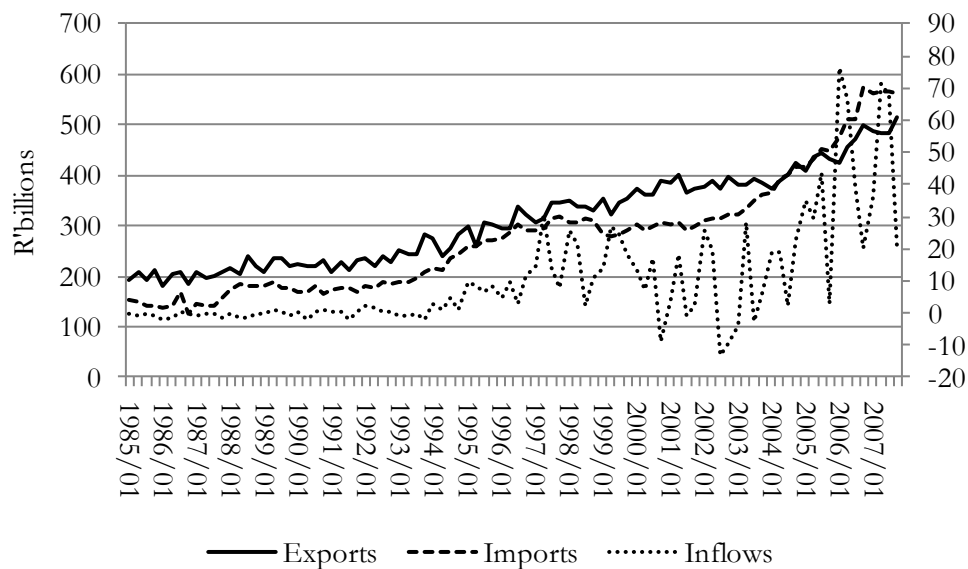


Fig. 1-3(b)

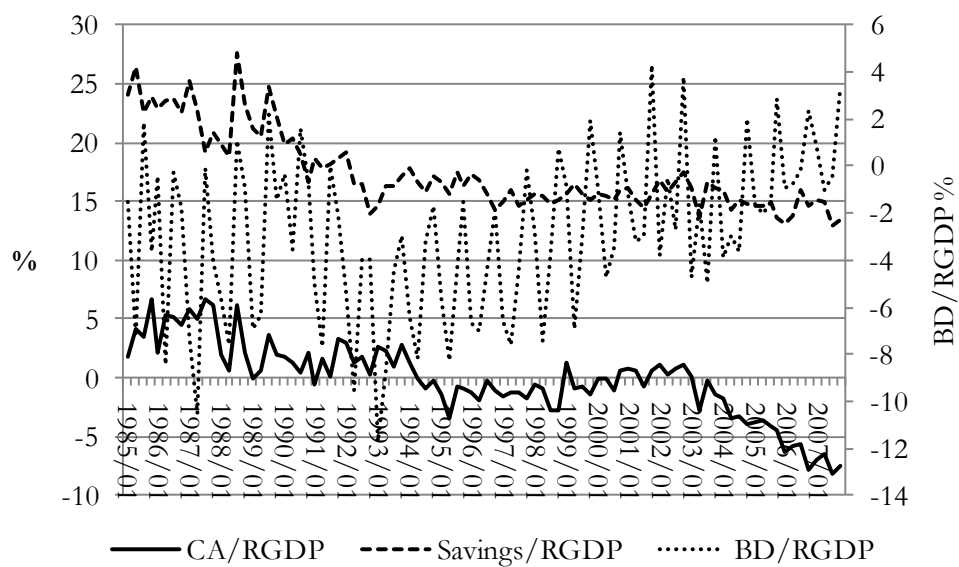


Table 1-2: Selected Trade Factors

Macroeconomic	1985:Q1-1995:Q1		1995:Q2-2007:Q4		2004:Q1-2007:Q4	
	R'billions	% Split	R'billions	% Split	R'billions	% Split
Exports (E)	225.44	462.3	380.02	1683.5	445.30	-1345.5
Imports (I)	176.68	362.3	357.45	1583.5	478.40	-1445.5
Total E-I	48.76	100.0	22.57	100.0	-33.10	100.0
CA/RGDP (%)	2.36	-	-2.13	-	-5.22	-
Savings/RGDP (%)	19.98	-	15.35	-	14.49	-
BD/RGDP (%)	-3.96	-	-2.08	-	-0.46	-

Source: South African Reserve Bank data. CA/RGDP and BD/RGDP represent the current account and budget deficit as a percentage of real GDP.

These dynamics have implications for economic growth because in theory, the three primary ways in which a country can increase its economic growth rate is through the export of manufactured goods (the export-led growth hypothesis), the import of intermediate goods and services, or through the efficient use of capital inflows, particularly FDI, as a substitute for domestic savings (the capital flow-led growth hypothesis).

Although South Africa has made steady progress in policy reform, from an isolated economy based on import substitution in the 1980's to an export-orientated free-market economy post-1995, economic growth continues to be insufficient to arrest the country's rising unemployment rate. Over the period from 1985 to the country's financial liberalisation in March 1995, economic growth averaged just 0.9%. In contrast, during the post-liberalisation period from 1995 to the end of 2007, economic growth averaged 3.6%. However, despite this recovery, the country's narrow unemployment rate rose from 17.6% in 1995 to over 26.7% in 2007. Although the reasons for the country's high unemployment rate are varied, ultimately a high unemployment rate is fundamentally linked to insufficient growth (Rodrik, 2008).

1.3 THESIS STATEMENT

In the years after South Africa's socio-economic and political liberalisation, the country has been reliant on capital flows to finance its current account deficit and fund economic development. Thus, policy-makers have had to balance their policy choices between the goals of attracting capital inflows on the one hand, and mitigating any significant detrimental impacts on the other. However, it is

possible that this goal has been complicated by the country's capital flow mix, which is skewed towards short-term capital flows rather than long-term FDI flows. Hence, empirical evidence will be used in this thesis to investigate the following thesis statement:

South Africa's capital flow components have divergent macroeconomic impacts and thus complicate, or even render impotent, the policy options available to attract capital inflows on the one hand and mitigate any significant detrimental effects on the other.

1.4 RESEARCH QUESTIONS

The previously mentioned thesis statement will be explored by investigating six research questions.

1.4.1 Research Question 1: Are the Capital Inflows 'Pushed' or 'Pulled'?

South Africa has experienced significant capital inflows following the country's political liberalisation in April 1994 and financial liberalisation in March 1995 (when international sanctions were officially ended, the dual exchange rate was unified and exchange controls were relaxed). Unfortunately, the bulk of the inflows have been in the traditionally volatile forms of portfolio and other flows rather than FDI. The experiences of emerging economies in Latin America and Asia have shown that a surge in 'hot' capital inflows can have beneficial and detrimental effects. The beneficial effects arise from the heightened capital available to finance investment and stimulate economic growth. However, the inflows also cause detrimental effects arising from increased inflationary pressures, current account deficits, and real exchange rate appreciation, which lead to a decrease in competitiveness and an increase in the vulnerability of the banking sector to foreign shocks (Kim, 2000).

The policy instruments available to counteract these detrimental side-effects largely depend on how the inflows arise. Hence the literature examining the determinants of capital flows has generally focussed on "push" (foreign) and "pull" (domestic) factors. Push factors relate to the economic developments in source countries that drive capital flows to recipient countries, such as changes in interest rates and heightened economic growth (Calvo *et al.*, 1993 and 1996; Fernandez-Arias, 1996; Chohan *et al.*, 1998). Whereas pull factors relate to the economic developments in recipient countries that attract capital flows from source countries (De Vita and Kyaw, 2008), such as low country risk

premiums (Neumeyer and Perri, 2005), disciplined fiscal policies (Schadler *et al.*, 1993), openness to trade (Williamson, 1993), good creditworthiness (Bekaert, 1995), and robust private consumption (Calvo and Vegh, 1999).

Hence, if capital flows are mostly affected by push factors, then domestic policy makers will have little control over the course of inflows and outflows. Whereas if capital flows are determined more by pull factors, then policy makers will be able to influence the direction of the flows using macroeconomic policy instruments. Thus, the first research question to be investigated in this study is: Have South Africa's post-liberalised capital inflows been most significantly affected by push or pull factors?

1.4.2 Research Question 2: What is the Relationship between the Capital Flows and Domestic Business Cycle Fluctuations?

In an increasingly globalised world, international trade and financial linkages have resulted in macroeconomic spillovers coupled with the synchronisation of business cycles (Kose *et al.*, 2003 and 2008). These developments in turn, have implications for global capital flows. During an expansionary phase in source countries, capital is typically 'pushed' to recipient countries. Consequently, policy makers in recipient countries could potentially adopt reactive, procyclical policy mechanisms to moderate the adverse impacts of the capital inflows. The capital can also be 'pulled' into recipient countries that offer better returns and investment opportunities. In this case, policy makers in recipient countries will be in a position to proactively adopt counter-cyclical policy choices that will attract and control the capital flows.

In contrast, during a contractionary phase, cash flows in source countries will typically shrink and as a result there will be less capital available for outbound investment. In addition, if the downturn occurs in both source and recipient countries, then risk-aversion will increase due to heightened uncertainty and declining returns, which will further stimulate capital outflows. Thus, capital outflows may be due to the repatriation of foreign investment or domestic investment in search of improved returns abroad (Broner *et al.*, 2011). Thus, these dynamics could potentially complicate the policy choices available to policy makers in recipient countries, suggesting that the policy choices available during expansionary phases may not be relevant or appropriate during contractionary phases of global and domestic business cycles.

The experiences of many emerging countries have shown that the cyclical relationship between the capital flows and domestic business cycle fluctuations are often procyclical rather than counter-

cyclical. Hence, this suggests that the capital flow cycle tends to reinforce rather than stabilise the business cycles of recipient countries (the ‘when-it-rains-it-pours syndrome’ of Kaminsky *et al.*, 2004). Studies of South Africa’s business cycles are relatively extensive, however to date there is no study that explicitly investigates the cyclical relationships between the country’s disaggregated capital flows and business cycles. Thus, the second research question to be investigated consists of the following three sub-questions: (i) are the relationships between South Africa’s capital flow components and domestic business cycle fluctuations procyclical, counter-cyclical or acyclical; (ii) are the relationships contemporaneous; and (iii), do the phases of the business cycle matter for the cyclicity of the capital flows?

1.4.3 Research Question 3: What is the Relationship between the Capital Inflows and Domestic Policies?

International capital flows have benefited emerging countries by facilitating the accumulation of foreign assets in good times and the depletion of those assets or increased borrowing during bad times, thus mitigating the deterioration of living standards that arise from shocks to domestic income and production (Bernanke, 2005). In exchange, international investors have been able to benefit from portfolio growth and risk mitigation via international diversification (Contessi *et al.*, 2008). However, capital inflows can have detrimental side-effects such as inflationary pressure, real exchange rate appreciation, widening current account deficits, and heightened financial instability. Consequently, maintaining a balance between monetary and fiscal policy is crucial for attracting capital inflows while managing possible macroeconomic repercussions.

According to the traditional Keynesian and Neo-Classical theories, policies should be counter-cyclical or acyclical respectively (Demirel, 2010). To achieve this, policy makers have traditionally proposed the use of counter-cyclical policies, which consist of tight monetary and fiscal policies coupled with flexible exchange rates; structural policies, which consist of trade liberalisation and regulatory banking supervision; and regulatory controls on capital inflows or capital outflows (Lopez-Mejia, 1999). However, in practise, the adoption of these various policy options by emerging countries has proven problematic, and thus the cyclical relationships between capital flows and policy choices are often procyclical rather than counter-cyclical.

Although studies of the cyclicity of South Africa’s fiscal and monetary policies are relatively extensive, no study to date has explicitly examined the cyclical relationship between the country’s disaggregated capital inflows and policy dynamics. Hence, the third research question consists of the

following four sub-questions: (i) are the cyclical relationships between South Africa's capital flows and fiscal and monetary policies procyclical, counter-cyclical, or acyclical; (ii) are the relationships contemporaneous or do the capital inflows lag or lead the policy factors; (iii) do the phases of the business cycle matter for the cyclical relationships; and (iv), does fiscal and monetary policy react to the capital flows or do the capital flows react to the policy factors?

1.4.4 Research Question 4: What Impacts do the Capital Inflows have on South Africa's Macroeconomy and Transmission Mechanisms?

Since the 1990s one of the most prominent factors that have shaped the international financial environment has been the rapid expansion of capital flows to developing countries, mostly due to financial sector liberalisation (Eichengreen, 2004). However, there is much debate regarding whether the benefits of capital flows outweigh the detrimental effects. Furthermore, reactions to the capital inflows are split between those that advocate policy intervention and those who do not.

Those in favour argue that if monetary policymakers do not intervene, then the rapid monetary expansion and excessive domestic demand for imports will cause inflationary pressure, a widening current account deficit, and appreciation of the exchange rate (Berument and Dincer, 2004). Eventually, worsening levels of bad debt may raise the country's risk profile to the extent that international financing ceases, capital flows reverse, domestic credit and investment collapse, and boom turns to bust (Caballero and Krishnamurthy, 2006). The common policy instruments include capital controls, removal of restrictions on capital outflows, trade liberalisation, exchange rate flexibility, reserve accumulation and sterilisation, and tight fiscal policy (Fernandez-Arias and Montiel, 1996).

Advocates in favour of non-intervention argue that the negative effects of capital inflows are due to financial market distortions arising from insufficient deregulation, information asymmetries, and excessive government interference. Thus, the non-interventionists argue for the strengthening of prudential supervision and the removal of over-regulation rather than increased intervention. Furthermore, it is argued that inflation targeting rather than asset price targeting offers a better stabilising mechanism (Gilchrist and Leahy, 2002).

Hence, these divergent views raise the following three-part question in the case of South Africa: (i) what are the macroeconomic impacts of the different forms of capital inflows; (ii) how does the central bank respond; and (iii), do capital inflows lead to a surge in credit extension, asset prices, and household consumption expenditure?

1.4.5 Research Question 5: What Impacts do the Short-Term Capital Inflows have on the Nominal Rand/U.S. Dollar Exchange Rate?

The currency crises among emerging countries over the last two decades have demonstrated that shifts in short-run factors such as capital flows, can have a significant impact on exchange rates (Steinheer, 2000; Hau and Rey, 2006). However, traditional exchange rate models such as purchase power parity (Cassel, 1918), Harrod-Balassa-Samuelson (Harrod, 1933; Balassa, 1964; Samuelson, 1964), and balance-of-payments (Gandolfo, 1979) tend to focus on the long-run equilibriums of contemporaneous fundamentals rather than on determinants of short-run fluctuations. In addition, traditional exchange rate models have been found in practice to produce poor in-sample results when applied to floating exchange rates (Meese and Rogoff, 1983a and 1983b; Flood and Rose, 1995; De Jong, 1997; Cushman, 2000).

LiPuma and Koelble (2009) note that it is possible that the traditional variables of inflation, current account balances, GDP and interest rate differentials increasingly fail to account for the heightened fluctuations of exchange rates because traditional models do not take the post-liberalised global environment into account. Two recent variants of the traditional approach, which attempt to take bond market movements into account, are the monetary and portfolio balance approaches. According to the monetary approach, the exchange rate is determined by the relative supply of, and demand for money. Thus an increase in the domestic money supply, or a rise in domestic interest rates, will depreciate the exchange rate, while an increase in GDP will cause the exchange rate to appreciate. In the portfolio balance approach, the exchange rate is the adjustment mechanism that keeps the domestic and foreign asset markets in equilibrium. Thus the primary difference between these two approaches is that the monetary approach assumes perfect substitutability between domestic and foreign bonds, and consequently supply is irrelevant, while the portfolio approaches assumes imperfect substitutability, and thus supply matters (Gandolfo, 2002: 227).

In contrast, the international finance literature posits that portfolio balance models should include both bonds and equities because bond flows are typically hedged, and thus exchange rates are more significantly affected by equity movements, driven by the need for portfolio diversification and heightened rates of return (Brooks *et al.*, 2004). Hence, as a follow on from the previous research question, the fifth research question uses an empirical model that includes traditional variables, bonds, equities, and country-specific factors to answer two sub-questions: (i) are South Africa's nominal Rand/U.S. Dollar exchange rate movements shaped by bond or equity flows; and (ii), are these factors different before and after the country's financial liberalisation in March 1995?

1.4.6 Research Question 6: Is Economic Growth in South Africa Driven by Trade, Capital Inflows, or Both?

South Africa has made steady progress in policy reform, from an isolated economy based on import substitution in the 1980's to an export-orientated free-market economy post-1995. As a result, South Africa's export and import volumes have increased substantially. However from 2004 to 2007, imports exceeded exports and thus the current account steadily deteriorated. In addition, domestic savings as a percentage of real GDP also declined, while capital inflows increased. Hence, the country's on-going trade imbalance has been financed by foreign capital inflows, particularly portfolio inflows. Furthermore, South Africa's rate of economic growth post-liberalisation has been relatively static, and unfortunately insufficient to arrest the country's rising unemployment rate. Although the reasons for the country's high unemployment rate are varied, ultimately a high unemployment rate is fundamentally linked to insufficient growth (Rodrik, 2008).

In recent decades theorists have posited that a country can increase its rate of economic growth through heightened trade in exports (the export-led growth hypothesis) or imports (the import-led growth hypothesis); or through the efficient absorption of capital inflows, particularly FDI (the FDI-led growth hypothesis). According to the export-led growth hypothesis (ELG), the export growth of manufactured goods leads to higher economic growth because of the associated externalities and spillover effects (Bhagwati, 1978; Krueger, 1978; Balassa, 1978; Kavoussi, 1984; Ram, 1987). However, recent endogenous growth models have argued that economic growth can also be driven by imports of goods and services, which provide firms with access to intermediate factors, foreign technology and knowledge (Grossman and Helpman, 1991; Coe and Helpman, 1995; Lawrence and Weinstein, 1999; Mazumdar, 2002).

In contrast, the capital flow-led growth hypothesis posits that the economic growth rate can be increased by supplementing domestic savings with foreign capital inflows (Reisen, 1998; Mody and Murshid, 2005). The bulk of empirical research on the relationship between capital flows and economic growth has historically focussed on the effects of FDI rather than portfolio flows, mainly because FDI is associated with the benefits arising from fixed investment and heightened export capacity, as well as technological, production, knowledge and organisational spillover effects (De Mello, 1997 and 1999; Borensztein *et al.*, 1998). However, portfolio investment has also been found to enhance economic growth through heightened savings mobilisation and deployment, financial sector development, risk-sharing, and heightened global liquidity (Bailliu, 2000; Soto, 2000; Reisen and Soto, 2001; Ferreira and Laux, 2009).

Hence, these theories raise four important sub-questions for South Africa: (i) is the country's economic growth most significantly associated with trade, capital inflows, or a combination of both; (ii) if economic growth in South Africa is caused by trade, then is exports or imports most significant; (iii) if economic growth in South Africa is caused by capital inflows, then is FDI or portfolio investment most significant; and (iv), is there a causal relationship between the country's trade dynamics and capital inflows?

1.5 LIMITATIONS

The main limitations associated with this research relate to data and methodologies.

1.5.1 Data Limitations

The FDI inflows (*DIL*), portfolio inflows (*PIL*), and other inflows (*OIL*) included in the SVAR model in Chapter 2 have not been normalised to GDP. The reason for this is that if the impulse responses and variance decompositions are applied to normalised capital flow data, then the output could include the responses of GDP as well, and thus lead to ambiguous results. In addition, the SVAR model includes an exogenous dummy variable in order to compensate for the capital flow outliers associated with the Anglo-American-De Beers unwinding in the second quarter of 2001. Similarly, the net capital inflows (*NDI*, *NPI* and *NOI*) in Chapter 4 have not been normalised to GDP in accordance with Kaminsky *et al.* (2004), who argues that when analysing the cyclical relationships between net capital flows and fiscal and monetary policy factors, the capital flow variables should not be normalised to GDP because movements in GDP could then offset movements in the capital flows, thus leading to ambiguous results.

In Chapters 3 and 4, outliers among the capital flows have been corrected prior to the application of the filtering techniques in accordance with the approach of Contessi *et al.* (2008) whereby the outliers are identified by visual inspection of the data and then replaced by the five-year moving average centred on the abnormal quarter. The timing of the applicable outliers relates to the capital flow effects associated with the Anglo-American-De Beers unwinding in the second quarter of 2001, as well as the heightened capital flow volatility in 2005 and 2006.

In Chapter 5, the vector error correction models (VECM) used to investigate the effects of the capital flows on the country's macroeconomy and transmission mechanisms, include dummy

variables to take account of the capital flow effects associated with the Anglo-American-De Beers unwinding in the second quarter of 2001, as well as the heightened volatility among the capital flow components in 2005 and 2006 (similar to Chapters 3 and 4).

Unlike the analyses conducted in the other chapters of this thesis, the analysis conducted in Chapter 6 includes pre-liberalisation and post-liberalisation data samples. However, the start date used to conduct the examination of the impact of portfolio flows on the Rand/U.S. Dollar exchange rate has been constrained by the limited availability of the South African Reserve Bank's net purchases of shares and bond data, and thus starts in the first quarter of 1988.

Finally, the capital inflow series used to conduct the analysis in Chapter 7 have been rescaled prior to being transformed into logarithmic series as there are negative values in the data. This transformation involved two steps. First, the capital inflows are rescaled using the equation $\ln(CF_t) = CF_t + [\text{abs}(\min(CF_{t,\dots,k}) + 1)]$, where CF_t are direct investment liabilities (DIL) and portfolio investment liabilities (PIL) and $\text{abs}(\min(CF_{t,\dots,k}))$ is the absolute value of the minimum data point measured over the whole sample from time $t=1$ to time $t=k$. In the second step, outliers among the capital flow series are corrected using the approach of Contessi *et al.* (2008) whereby the outliers are identified by visual inspection of the data and replaced by the five-year moving average centred on the abnormal quarter.

1.5.2 Methodological Limitations

The empirical analyses used to investigate the research questions in the following chapters of this thesis are subject to certain methodological limitations. Hence, these limitations are briefly discussed on a per-chapter basis below.

First, the number of variables included in the empirical model used to analyse the push-pull dynamics of South Africa's capital flow components in Chapter 2 has been limited by the structural vector autoregression (SVAR) approach, which can only deal with 8-10 variables simultaneously (Garrett *et al.*, 1999: 12). Therefore, the empirical model includes nine variables consisting of two foreign (push) variables, four domestic (pull) variables, and three capital flow variables.

The empirical analyses conducted in Chapters 3 and 4 both make use of filtering techniques. However, although widely used in the business cycle literature, filtering techniques are subject to recent criticism. Cogley and Nason (1995), and Harvey and Jaeger (1993) report that the Hodrick-Prescott filter can generate cyclical periodicity even if none is present when applied to random walk

processes. Moreover, Harding and Pagan (2002: 376) argue that filtering techniques do not uniquely identify the permanent component, and that removing the permanent component is not equivalent to removing shocks. Furthermore, in a South African context, Boshoff (2010) finds that high-frequency filters are not appropriate measures of the country's business cycles because they tend to be moderately correlated with cumulative supply and demand shocks. In contrast, medium-term deviation cycles are found to be highly correlated with cumulative shocks and thus more suitable for studying South Africa's business cycle deviations. Hence, the analysis of the cyclical relationships between the capital flows and business cycle fluctuations conducted in Chapter 3 makes use of the Christiano-Fitzgerald (2003) band-pass filter, which has been found to be more suited to identifying longer-term fluctuations than the Baxter-King filter, which is more suited to studying short duration fluctuations (Everts, 2006a and 2006b). Furthermore, although the Baxter-King filter could potentially be useful for analysing the short-run cyclical relationships between the capital flows and fiscal and monetary policies conducted in Chapter 4, given the relatively short sample period (1994 – 2007), the analysis has made use of the Christiano-Fitzgerald filter instead in order to avoid truncating the data (the Baxter-King filter typically requires truncating the data by 12 leads and lags).

In Chapter 5, the effects of foreign capital inflows on South Africa's macroeconomy and on the transmission mechanisms of credit extension, asset prices, and household consumption expenditure are examined using the vector error correction approach of Johansen and Juselius (1990) with impulse response analysis. Ideally one would want to model the interactions between all of the various variables in a large VECM system. However, due to the number of variables this is not possible and thus this study uses an intermediate approach as developed by Christiano *et al.* (1996), Jansen (2003), and Kim and Yang (2009); which makes use of a common set of control variables in four separate VECM models.

According to the literature, exchange rate dynamics are frequently investigated using a vector autoregression (VAR) model or a single equation model. The choice of approach depends to a large extent on whether the focus of the analysis is on real or nominal exchange rates, and on equilibrium versus short-term fluctuations. Hence, VAR models are typically used to explore the equilibrium relationships of real exchange rates while single equation models are used to study short-term nominal exchange rate movements. Since the empirical investigation undertaken in Chapter 6 is focused on the short-term fluctuations of the nominal Rand/U.S. Dollar exchange rate, the approach makes use of an ordinary least squares (OLS) model consisting of the fundamental, international finance, and country-specific variables that have been found to be significantly associated with Rand exchange rate movements in the literature.

In Chapter 7, the causal relationships between economic growth, exports, imports, and capital flows are examined. In circumstances where all of the variables are level stationary it is possible to use standard Granger analysis (1969). However, this is not possible when the variables are differenced stationary because the traditional F -test and Wald tests statistics used to determine whether the VAR parameters are stable and jointly zero do not have standard distributions (Sims *et al.*, 1990 and Toda and Phillips, 1993). In addition, Giles and Mirza (1999) argue that pre-testing for unit roots and cointegration may induce an over-rejection of the non-causal null because unit root and cointegration tests tend to suffer from size distortions. Thus, some of the variables used to conduct the analysis in Chapter 7 are found to be first-differenced stationary, the Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL) lag-augmented test for non-causality has been used instead of the Granger causality test (1969).

1.6 CONTRIBUTION OF THE STUDY

The empirical investigations undertaken in each chapter of this thesis contribute towards a comprehensive macroeconometric analysis of South Africa's capital flow components as follows.

Chapter 2 presents the only study that uses a structural vector autoregression (SVAR) model with impulse response and variance decomposition analysis to examine the push-pull dynamics of South Africa's post-liberalisation capital flow components. Historically, the two most significant studies of the push-pull dynamics of South Africa are Wesso (2001) and Ahmed *et al.* (2007). However both these studies have limitations, which the analysis presented in Chapter 2 seeks to overcome.

Wesso (2001) investigates the foreign and domestic determinants of the country's net capital flows but does not separate the capital flow components and thus does not consider that the bulk of South Africa's capital flows consist of portfolio investment and other short-term flows rather than FDI. Ahmed *et al.* (2007) identify and compare the general determinants of South Africa's capital flow components against those of 81 other countries using a panel Generalised Method of Moments (GMM) approach rather than a traditional structural push-pull approach and thus does not investigate the impacts of country-specific push-pull shocks. In addition, both these studies are limited by the non-availability of data. Wesso uses quarterly data covering the period from 1991 to 2000 and Ahmed *et al.* use annual data covering the period from 1975 to 2002. Thus these studies assume that the mix of push-pull factors has not been significantly affected by South Africa's financial liberalisation and reintegration into the global economy after 1995.

Despite these short-comings, Wesso (2001) finds that the capital flows are negatively affected by high inflation rates and government deficits, and positively affected by strong economic growth and high interest rate differentials. Thus Wesso concludes that South Africa's net capital flows are mostly affected by pull factors. Ahmed *et al.* (2007) finds that South Africa's FDI inflows are positively affected by the pull factors of economic growth, trade openness, infrastructure development, and institutional quality, but negatively affected by exchange rate volatility. With regards to portfolio investment, Ahmed *et al.* report that the primary determinants are economic growth, and institutional quality. However, push factors were also found to be significant as FDI is significantly affected by foreign long-term bond yield movements while portfolio investment is significantly affected by foreign short-term interest rate movements. Hence Ahmed *et al.* conclude that although the FDI and portfolio investment flows are significantly affected by pull factors, push factors also play a significant part in shaping the country's capital flow dynamics.

The results of the analysis presented in Chapter 2 adds further insight to these studies by showing that South Africa's FDI inflows are most significantly impacted by pull factor shocks, while portfolio and other inflows are impacted by pull factors and, to a lesser extent, by push factors as well. Hence with regards to FDI, the results suggest that, on the one hand, South Africa's policymakers can use policy mechanisms to shape the FDI flows; but on the other hand, the result implies that the country's limited success in attracting FDI inflows arises from the ineffective implementation of pull factor policies and is thus a 'self-inflicted wound.' In the case of portfolio and other inflows, the findings imply that the country's 'hot' flows are impacted by global business cycle dynamics and thus domestic policy mechanisms may only be partially effective in attracting the capital flows and mitigating their detrimental impacts.

Having examined the push-pull dynamics of the capital flows, the next step of the investigation is to gain insight into the effects of business cycle fluctuations and policy responses. Thus, Chapters 3 and 4 present the first studies that explicitly detail the cyclical relationships between the country's disaggregated capital flows and business cycles, and between South Africa's disaggregated capital inflows and fiscal and monetary policies.

The empirical analysis conducted in Chapter 3 uses Christiano-Fitzgerald (2003) filtered correlation analysis to investigate the cyclical relationships between South Africa's post-liberalised capital flows and domestic business cycle fluctuations. Overall, the results show that FDI inflows are counter-cyclical and proactive, while the 'hot' inflows are acyclical. Thus, South Africa's post-liberalisation 'hot' inflows have not been significantly associated with domestic business cycle fluctuations. In contrast, the capital outflows are found to be consistently procyclical and proactive, suggesting that the outflows are more significantly associated with domestic business cycle

fluctuations than the capital inflows. Analysis of the business cycle phases further show that FDI and other investment inflows are most significantly procyclical during down-phases, while FDI and portfolio investment outflows are most significantly procyclical during up-phases. In contrast, the business cycle phases do not significantly impact portfolio inflows and other investment outflows.

On a more detailed level, the analysis finds that the cyclical relationships between the inflows and the business cycle components of exports, household consumption and gross fixed investment are generally procyclical. In contrast, the capital outflows are counter-cyclically associated with exports and household consumption, and procyclically associated with fixed investment. Although these results accord with the international literature of Contessi *et al.*, (2008), which indicates that the relationships between the capital inflows and South Africa's business cycle fluctuations demonstrate cyclical associations typical of emerging countries, the finding that the capital outflows rather than the inflows are more significantly cyclically associated with domestic business cycle fluctuations is a country-specific dynamic.

Hence, the results of the analysis presented in Chapter 3 suggest that domestic policy choices need to accomplish two goals: first, to stabilise the business cycle so as to limit the degree of capital flight and repatriation during expansionary phases; and second, to smooth the capital inflow-driven private consumption patterns. The three policy mechanisms available to achieve these tasks consist of counter-cyclical monetary policy, counter-cyclical fiscal policy, and nominal exchange rate flexibility (Lopez-Mejia, 1999). However, the effectiveness of these policies can be impacted by structural factors, as well as by the cyclicity of the policy responses to the capital flows themselves. Thus as a follow-on from Chapter 3, Chapter 4 presents an empirical investigation of the cyclical relationships between South Africa's capital inflows and domestic fiscal and monetary policies using Christiano-Fitzgerald filtered correlation analysis and Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL) causality tests.

With regards to fiscal policy, the analysis shows that the cyclical relationships between net direct investment and net other investment, and fiscal policy tend to be counter-cyclical. In contrast, the cyclical relationship between net portfolio investment and fiscal policy tends to be acyclical, which implies that the bulk of South Africa's net capital inflows have no cyclical relationship with fiscal policy. Net direct investment is also found to have no cyclical relationship with government expenditure but is counter-cyclically associated with taxation revenues, which indicates that South Africa's net direct investment inflows do not significantly increase government receipt of taxation from foreign-owned companies. Furthermore, both net direct investment and net other inflows are found to have a counter-cyclical association with the inflation tax, which suggests that foreign investors use the capital movements as hedging instruments to mitigate the effects of inflation taxes.

With regards to monetary policy, the results show that the cyclical relationships between net portfolio inflows and monetary policy are procyclical and lagging, which implies that the bulk of South Africa's net capital inflows are reactive and behave in accordance with the 'when-it-rains-it-pours syndrome' of Kaminsky *et al.* (2004) whereby portfolio investment increases when monetary policy is loosened and decreases when monetary policy is tightened. In contrast, net direct investment does not have a consistent cyclical relationship with monetary policy. However, net other inflows are found to be procyclically associated with credit, but are counter-cyclically associated with money supply and the Tbill rate, which suggests that the short-term flows focus on the returns to be gained from heightened private sector credit extension or from the rising rates of return.

In addition, examination of the impacts of the business cycle phases on the cyclical relationships reveals that net direct investment and net portfolio inflows tend to be more procyclical during up-phases of the business cycle, while other inflows tend to be more procyclical during down-phases. Finally, the results of the causality tests show that fiscal policy reacts to monetary policy and capital flows, while capital flows react to monetary policy.

Hence, three policy conclusions arise from the analysis presented in Chapter 4. First, given the country's high welfare expenditure, low savings rate, and the inconsistent relationships between the capital flows and fiscal policy factors, the use of fiscal restraint as a fiscal policy tool is likely to prove problematic. Second, stability of South Africa's capital flows is reliant on a stable and predictable monetary policy outlook. Third, South Africa's policy makers are in a better position to control the country's capital flows using monetary policy than fiscal policy.

Having examined the associations between the capital flows and business cycle and policy fluctuations, the next phase of the empirical examination explores how the impacts are transmitted through the South African economy. Hence, Chapter 5 is among the first study to present a combined investigation of the impacts of post-liberalisation capital inflows on South Africa's macroeconomy and the transmission channels of credit extension, asset prices, and household consumption expenditure. The application of VECM models with impulse response analysis shows that FDI and portfolio inflows increase GDP, lead to an appreciation of the exchange rate, and decrease interest rates and prices. Other inflows in contrast, do not have a significant long-run impact on GDP, lead to a depreciation of the exchange rate, and increase interest rates and prices. In addition, it is found that the central bank uses a strategy of on-going sterilisation for portfolio inflows and targeted sterilisation for FDI, but does not sterilise other inflows.

With regard to the impacts of the capital inflows on the credit transmission mechanisms, the results show that portfolio inflows have a positive impact on all of the credit channels of total credit, mortgages and credit card extension, while FDI has a positive effect on credit card expenditure, and

other inflows have a positive impact on mortgage extensions. Thus, these results indicate that the 'hot' capital flows have a positive effect on mortgage extensions, while FDI has a negative effect, thus supporting Tomura (2010) who asserts that short-term capital flows are associated with property booms.

The results of the asset price impulse responses show that only FDI shocks have a positive effect on the All-Bond Index (ALBI), while portfolio inflows significantly affect the All-Share Index (ALSI). Other inflows have a negative effect on the ALBI and a short-run positive effect on the ALSI. With regard to house prices, it is found that portfolio inflows have a positive effect, while FDI and other inflows have negative effects. Thus, asset prices are found to be most significantly impacted by portfolio inflows, which accords with the international literature of Kim and Yang (2009), Jansen (2003), Benjamin *et al.* (2004), Case *et al.* (2005), and Haurin and Rosenthal (2005). The results of the household consumption expenditure impulse responses shows that in the long-run, all of the capital inflows have a negative effect on household consumption, but in the short-run, other inflows have the most significant positive effect.

Thus, the results of the analysis presented in Chapter 5 imply that although the different capital flow components have relatively varied impacts on the South African economy, the impacts of FDI and portfolio inflow shocks tend to be more similar compared to the effects of other inflow shocks.

Exchange rates are traditionally considered to be a key transmission mechanism, and thus Chapter 6 examines the evolving determinants of South Africa's nominal Rand/U.S. Dollar exchange rate. Historically, studies such as Aron *et al.* (1997), MacDonald and Ricci (2004), and Frankel (2007) have reported that the South African Rand is a 'commodity currency.' However, these studies have limitations. Aron *et al.* (1997) include long-run and total capital flows in the analysis rather than separating bonds and equities, while MacDonald and Ricci (2004) and Frankel (2007) do not include capital flows in their empirical estimations. In addition, all of these studies include sample start-dates that pre-date liberalisation, and thus do not consider that the country's exchange rate dynamics may have changed as South Africa reintegrated into the global economy.

Hence, Chapter 6 seeks to overcome these short-comings by presenting the first study to explicitly investigate whether South Africa's nominal Rand/U.S. Dollar exchange rate has been shaped more significantly by bond flows or by equity flows, and whether the significant determinants are different before and after the country's financial liberalisation in March 1995. The empirical analysis makes use of regression models that include the determinants of capital flows, fundamentals, and country-specific factors over the long-run of 1988 to 2007, as well as over the sub-sample periods of 1988 to 1995, and 1995 to 2007.

The results show that in the long run, the net purchase of shares on the Johannesburg Stock Exchange (JSE) by non-residents, the long-term interest rate differential, and the Dollar price of gold, significantly explain movements in the Rand/U.S. Dollar exchange rate, which suggests that the exchange rate has been more significantly shaped by equity movements than by bond movements. However, the results further show that the factors that are associated with the Rand/Dollar exchange rate are different before and after 1995. Prior to 1995, both bond and equity purchases by non-residents, the long-term interest rate differential, the political risk index, and the Dollar price of gold were significant. However, post-1995, only the net purchases of shares on the JSE by non-residents and the long-term interest rate differential are significant.

Hence the results of the analysis presented in Chapter 6 indicate that before financial liberalisation in March 1995, international investors were more risk averse and thus favoured gold-price driven, hedged bond investments. However, after the country democratised and globalised, investors turned their attention to the excess returns to be obtained from equity investments and consequently the significance of bond investments and the gold price diminished. Thus these results suggest that the Rand has changed from being a 'commodity currency' in the years before 1995 to being an 'equity currency' after 1995.

Chapter 7 presents the final part of the analysis, which is to examine the extent to which the capital inflows contribute to economic growth in post-liberalised South Africa. According to economic theory, economic growth in emerging countries can be enhanced in three ways: through heightened trade in exports (the export-led growth hypothesis), through heightened trade in imports (the import-led growth hypothesis); or through the efficient absorption of capital inflows, particularly FDI (the FDI-led growth hypothesis).

South African studies that investigate the export-led growth hypothesis are relatively limited and the results of existing studies are varied. Bahmani-Oskooee and Alse (1993) find that the causal relationship between export growth and economic growth is bidirectional, but Dutt and Ghosh (1996) find that there is no significant causal relationship between exports and economic growth. More recently Ziramba (2011) reports that there is evidence of export-led growth, but only in the case of merchandise exports, while income receipts and service exports have reverse causality, and net gold exports have no causal relationship.

Similarly, studies of FDI-led growth also report mixed results. Esso (2010) finds that economic growth causes FDI, while Fedderke and Romm (2006) find that FDI has positive spillover effects on capital and labour, and thus on economic growth. In addition, both these studies use samples that have pre-liberalisation start-dates, and thus do not consider the effects of South Africa's reintegration into the global economy post-1995.

Hence, Chapter 7 presents the only study that examines the causal relationships between exports, imports, capital inflows and economic growth in post-liberalised South Africa; unlike most studies, which only consider the effect of exports or FDI separately, and exclude the effects of imports. The causality tests show that overall, economic growth in South Africa is driven primarily by trade and fixed investment rather than by capital inflows, which suggests that the country's sub-optimal economic growth rate (and thus high unemployment rate) is causally linked to insufficient levels of trade, fixed investment and FDI inflows. In addition, the results show that South Africa's infrastructure development is derived from heightened trade activity, rather than *vice versa*. With regards to the capital flows, exports are found to have a causal relationship with portfolio inflows rather than with FDI, which implies that portfolio inflows are more integrated into the country's export-led growth dynamics. In theory, FDI tends to complement export-led growth and thus South Africa's export potential could be improved if the country focussed on attracting higher levels of fixed investment FDI. Furthermore, labour productivity is found to have a bidirectional causal relationship with FDI, suggesting that FDI does have positive spillover effects on domestic labour productivity, which then in turn attracts additional FDI.

Thus three policy implications arise from these results: First, South Africa's economic growth strategies need to integrate the development of the non-commodity manufacturing export sector with related fixed investment programs; second, labour market distortions need to be reduced by improving job skills, and easing labour market conditions; and finally, there needs to be a focus on reducing the impediments that are hampering inflows of fixed investment FDI.

1.7 LAYOUT OF THE STUDY

The remainder of this thesis proceeds as follows. In Chapter 2, a structural VAR (SVAR) model with impulse response and variance decomposition analysis is used to examine the push-pull dynamics of South Africa's post-liberalisation capital inflow components. Capital flows can significantly impact the business cycle fluctuations of recipient countries, and thus Christiano-Fitzgerald (2003) filtered correlation analysis is used in Chapter 3 to investigate the cyclical relationships between the capital flow components and South Africa's business cycle fluctuations. In theory, the detrimental impacts of exogenous business cycle driven capital flows can be moderated using policy mechanisms. Hence in Chapter 4, Christiano-Fitzgerald (2003) filtered correlation analysis is used to examine the cyclical relationships between the country's capital inflow components and fiscal and monetary policies. In Chapter 5, four vector error correction models

(VECM) with impulse response analysis are used to examine the effects of capital inflows on South Africa's post-liberalisation macroeconomy and on the transmission mechanisms of credit extension, asset prices, and household consumption expenditure. In Chapter 6, an international finance regression model is used to examine the extent to which bond and equity flows have shaped South Africa's nominal Rand/U.S. Dollar exchange rate before and after 1995. Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) non-causality tests (TYDL) are used in Chapter 7 to examine the causal relationships between exports, imports, capital inflows and economic growth in South Africa; and finally, the results of the empirical analyses are summarised and discussed in Chapter 8.

University of Cape Town

CHAPTER 2

A PUSH-PULL ANALYSIS OF SOUTH AFRICA'S CAPITAL INFLOWS

2.1 INTRODUCTION

South Africa has experienced significant capital inflows following the country's political liberalisation in April 1994 and financial liberalisation in March 1995.³ Unfortunately, the bulk of the inflows have been in the traditionally volatile forms of portfolio and other flows rather than FDI. The experiences of emerging economies in Latin America and Asia have shown that a surge in 'hot' capital inflows can have beneficial and detrimental effects. The beneficial effects arise from the heightened capital available to finance investment and stimulate economic growth. However, the inflows also cause detrimental effects arising from increased inflationary pressures, current account deficits, and real exchange rate appreciation, which lead to a decrease in competitiveness and an increase in the vulnerability of the banking sector to foreign shocks (Kim, 2000).

The policy instruments available to counteract these detrimental side-effects largely depend on how the inflows arise. Hence the literature examining the determinants of capital flows has generally focussed on "push" (foreign) and "pull" (domestic) factors. Push factors relate to the economic developments in source countries that drive capital flows to recipient countries, while pull factors relate to the economic developments in recipient countries that attract capital flows from source countries (De Vita and Kyaw, 2008). Hence, if capital flows are mostly affected by push factors, then domestic policy makers will have little control over the course of inflows and outflows. Whereas if capital flows are determined more by pull factors, then policy makers will be able to influence the direction of the flows using macroeconomic policy instruments.

In this chapter, a structural VAR (SVAR) model with impulse response and variance decomposition analysis is used to determine whether South Africa's capital inflows have been more significantly affected by push or pull factors after financial liberalisation in March 1995. The remainder of this study is organised as follows: Section 2.2 presents an overview of South Africa's

³ When international sanctions were officially ended, the dual exchange rate was unified and exchange controls were relaxed.

recent experience with capital inflows; Section 2.3 reviews the empirical literature on push-pull analysis; in Section 2.4 the empirical model and methodology are discussed; Section 2.5 sets out the data utilised in the study; the empirical results are presented in Section 2.6; and finally, Section 2.7 concludes the chapter and discusses the key findings.

2.2 STYLISTED FACTS ON SOUTH AFRICA'S POST-LIBERALISED CAPITAL INFLOWS

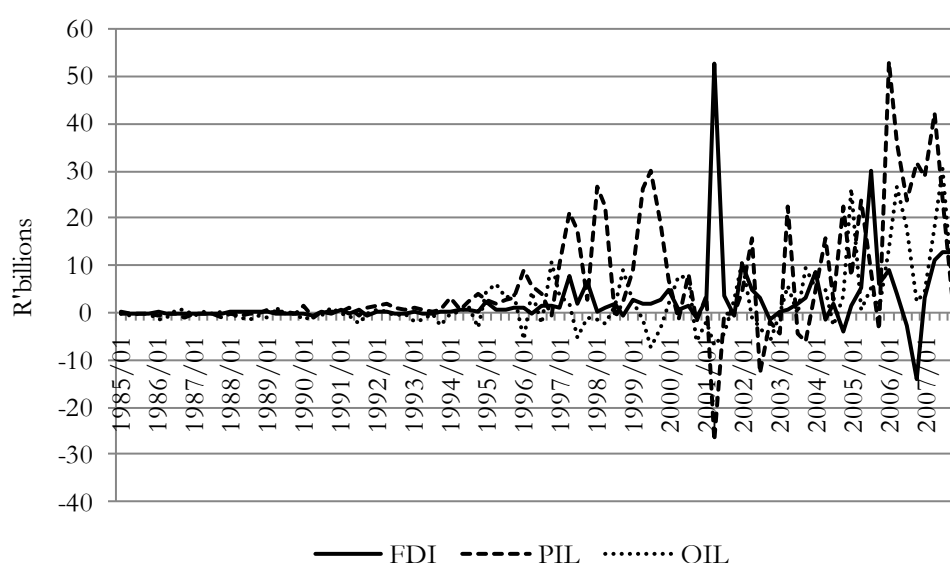
South Africa has experienced a significant increase in capital inflows in recent years. According to the South African Reserve Bank data, graphically presented in Figure 2-1, total inflows grew from a negative R2.5 billion in 1985 to R196.3 billion in 2007. Furthermore, the bulk of the inflows have occurred following the country's financial liberalisation in March 1995. Between the first quarter of 1985 and the first quarter of 1995, total inflows were just R7.8 billion compared to total inflows of R937.9 billion over the period from the second quarter of 1995 to the end of 2007.

However, unlike in many other emerging countries, the bulk of South Africa's post-liberalisation inflows have been in the traditionally short-term forms of portfolio and other investment inflows rather than FDI (Ahmed *et al.*, 2007; Arvanitis, 2006). From the second quarter of 1995 through to the end of 2007, the share of FDI was 22% (R206.2 billion) of total inflows, while 'hot' inflows made up the remaining 78% with portfolio inflows comprising 57.2% (R536.9 billion) and other inflows comprising 20.8% (R194.8 billion).

Furthermore, the bulk of South Africa's FDI inflows were generated by a few isolated transactions, most of which have been in the form of mergers and acquisitions (M&A)⁴ rather than 'greenfield' fixed investment (Gelb and Black, 2004). In addition, since 1995, the amount of FDI outflows by South African firms investing abroad exceeded the amount of FDI inflows (Dube, 2009). Hence, South Africa's ability to attract FDI investment post-1995 has been limited, and thus the economy continues to be reliant on short-term inflows to finance economic development and the current account deficit.

⁴ These include the 30% sale of Telkom to a U.S.-Malaysian consortium and the privatisation of Sun Air Corporation in 1997, the Anglo-American-De Beers unwinding in 2001, the Barclays Bank-ABSA bank transaction in 2005, and the Standard Bank-Bank of China transaction in 2007 (the significant FDI outflow in 2006 arose when MTN invested \$5.5 billion in INVESTCOM).

Figure 2-1: Capital Inflows



In conjunction with heightened post-liberalisation capital flows and macroeconomic activity, the country's reintegration into the global economy has also driven substantial trade activity. Figure 2-2(a) shows that South Africa's export volumes rose from a 4-quarter average of R201.4 billion in 1985 to R492.6 billion in 2007, while import volumes increased from an average of R146.2 billion to R564.0 billion over the same period. Thus, from 1985 to the second quarter of 1995, exports exceeded imports by 27.6%, declining to 6.3% from the second quarter of 1995 through 2007. However, imports exceeded exports by 6.9% from 2004 through 2007. In addition, the correlation between the inflows and imports (74.5%) is greater than the correlation between the capital inflows and exports (65.8%), which suggests that the inflows are more closely associated with import consumption than export investment.

Furthermore, Figure 2-2(b) shows that as imports began to exceed exports, the current account deteriorated from a 4.1% surplus in 1985 to a 7.3% deficit in 2007. Domestic savings as a proportion of real GDP steadily decreased from 24.2% in 1985 to 14.1% in 2007, while the budget deficit deteriorated from -2.6% in 1985, to -5.0% in 1995, but then recovered to 0.7% in 2007.

Therefore, although South Africa's volumes of exported goods have increased post-1995, imports overtook exports after 2004 and thus the current account deficit has deteriorated as domestic savings have weakened. At the same time, the country experienced significant capital inflows, but the bulk has been in portfolio and other short-term flows rather than FDI.

Figure 2-2: Total Capital Inflows and Selected Trade Factors

Fig. 2-2(a)

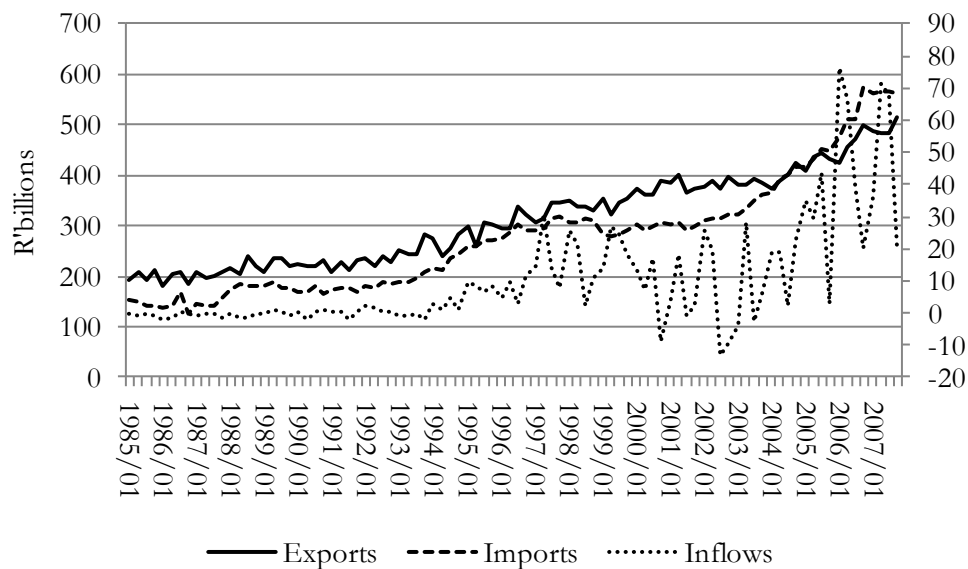
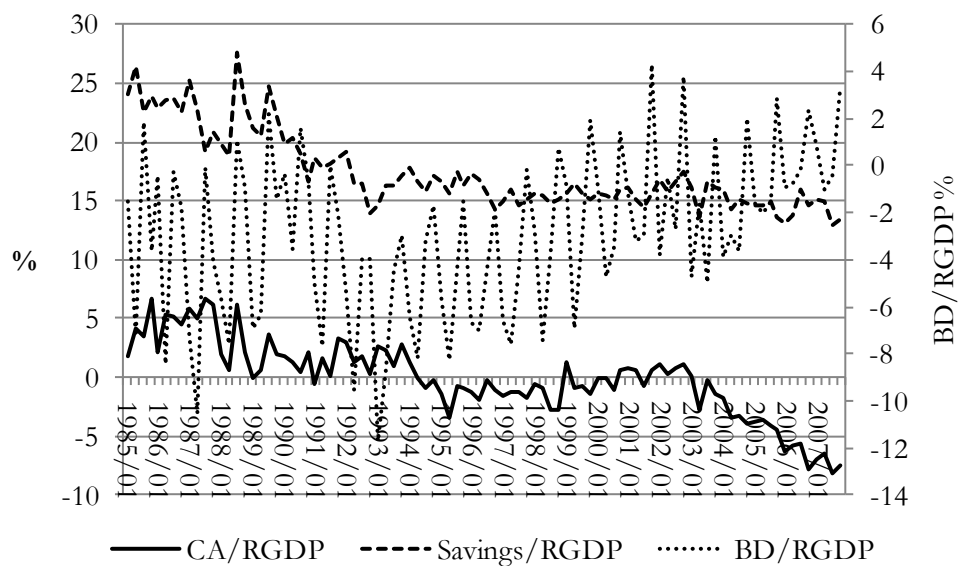


Fig. 2-2(b)



2.3 LITERATURE REVIEW

Seminal research by Calvo *et al.* (1993) and Fernandez-Arias (1996) initially found that changes in international interest rates and economic growth were the primary determinants of capital flow movements. However, studies by Schadler *et al.* (1993) and Fernandez-Arias and Montiel (1996) subsequently argued that the isolation of these significant push factors did not negate the potential significance of pull factors. Further investigations found that a range of pull factors are also significant determinants of capital inflows, which include creditworthiness (Bekaert, 1995; Calvo *et al.*, 1996; Lensink and White, 1998), fiscal policies (Schadler *et al.*, 1993), openness to trade (Williamson, 1993), private consumption (Calvo and Vegh, 1999), institutional quality (Alfaro *et al.*, 2008), and country risk premiums (Neumeyer and Perri, 2005).

Subsequent research increasingly focused on the extent to which regional differences in capital flows can be explained using a combination of push and pull factors. For instance, Chohan *et al.* (1998) finds that portfolio flows to Latin America are equally affected by push and pull factors, while the flows to Asia are driven more by pull factors. Chohan *et al.* further report that equity flows and bond flows react differently to the push and pull factors. Equity flows are found to be sensitive to push factors and domestic rates of return (pull factor), while bond flows are found to be more sensitive to the pull factors of domestic credit ratings and the secondary market price of debt. Similarly, Baek (2006) finds that portfolio flows to Asia are mainly pushed by investors' risk appetite, while portfolio flows to Latin America are pulled by domestic growth. Jeanneau and Micu (2002) report that although bank flows to Latin America and Asia are affected by both push and pull factors, since the 1990's, pull factors have become increasingly important and have tended to exhibit a procyclical influence.

The regional disparities highlighted in these studies have implications for policy makers. Montiel and Reinhart (1999) find that although push factors are significant determinants of the volume and composition of total capital flows to Asia, pull factors explain the distribution of short-term flows. Hence they conclude that even if push factors have a significant impact on a country's capital flows, policy makers are not completely powerless because they can use policy instruments to shift the composition of the capital flows over time. Furthermore, Kim (2000) argues that although the four emerging countries of Mexico, Chile, Korea, and Malaysia are all affected mostly by push factors, policy makers should still take cognisance of their domestic financial arrangements, exchange rate policies, and macroeconomic fundamentals because international investors are constantly re-

evaluating where and how much to invest, and thus changes in a country's pull factors could result in a financial crisis arising from capital mobility.

In recent years, push-pull studies have increasingly shifted attention away from the dynamics of regions and focussed on individual countries instead. Hoffmaister and Roldos (2001) examine the sources of macroeconomic fluctuations in Brazil and Korea over the period from 1976 to 1993. The study finds that supply shocks are the primary source of GDP fluctuations in both countries, while aggregate demand shocks have a significant short-run impact on Brazil but not on Korea. Hoffmaister and Roldos further report that after controlling for domestic factors and supply shocks; push factor shocks explain only 20% of the variance of GDP for both countries. Hence, the study finds that Brazil and Korea are both significantly affected by pull factor shocks.

Ying and Kim (2001) investigate the push-pull dynamics of Korea and Mexico over the period from 1960 to 1996. The study also includes two sub-samples covering 1960 to 1979 and 1980 to 1996 in order to take into account the structural break arising from the debt crisis of the 1980's, inflation stabilisation, trade liberalisation, and capital mobility. The results of the sub-sample analysis finds that domestic supply shocks are most significant in the early period but post-1980, shocks to foreign output and interest rates account for over 50% of capital inflows to both countries. Filer (2004) also examines the push-pull dynamics of Korea but uses the sample period from 1984 to 1996, which is after the structural break-date. In addition, because Japan is an important source of FDI and portfolio investment to Korea, Filer includes equally weighted U.S. and Japanese output and interest rates as additional push factors. The results of the empirical analysis are similar to Ying and Kim (2001) whereby inflows to Korea are significantly impacted by push factor shocks. Furthermore, real money shocks are found to be more important than global shocks in the short-run and nearly as important in the long-run. Thus Filer concludes that although Korea's capital flows are shaped by push factors, the dynamics are more complex than a representation of the 'unstable push-capital' typical of small open economies such as those of Brazil and Mexico.

Studies of the push-pull dynamics of South Africa are relatively scarce. Wesso (2001) investigates the foreign and domestic determinants of the country's net capital flows. The results show that the capital flows are negatively affected by high inflation rates and government deficits, and positively affected by strong economic growth and high interest rate differentials. Thus Wesso concludes that South Africa's net capital flows are mostly affected by pull factors. Ahmed *et al.* (2007) uses a panel Generalised Method of Moments (GMM) approach to identify and compare the general determinants of South Africa's capital flow components against those of 81 other countries. The results show that South Africa's FDI inflows are positively affected by the pull factors of economic growth, trade openness, infrastructure development, and institutional quality, but negatively affected

by exchange rate volatility. With regards to portfolio investment, Ahmed *et al.* report that the primary determinants are economic growth, and institutional quality. However, push factors are also found to be significant as FDI is significantly affected by foreign long-term bond yield movements while portfolio investment is significantly affected by foreign short-term interest rate movements. Hence Ahmed *et al.* conclude that although the FDI and portfolio investment flows are significantly affected by pull factors, push factors also play a significant part in shaping the country's capital flow dynamics.

However both these studies have limitations. Wesso (2001) does not separate the capital flow components and thus does not consider that the bulk of South Africa's capital flows consist of portfolio investment and other short-term flows rather than FDI (Ahmed *et al.*, 2007; Arvanitis, 2006). Ahmed *et al.* (2007) use a panel approach rather than a traditional structural push-pull approach and thus does not investigate the impacts of country-specific push-pull shocks. In addition, the studies are limited by the non-availability of data. Wesso uses quarterly data covering the period from 1991 to 2000 and Ahmed *et al.* use annual data covering the period from 1975 to 2002. Thus these studies assume that the mix of push-pull factors has not been significantly affected by South Africa's financial liberalisation and reintegration into the global economy after 1995.

2.4 METHODOLOGY

The empirical model developed in this study examines the effects of foreign (push) and domestic (pull) shocks on South Africa's capital inflow components of FDI, portfolio investment, and other investment. The foreign variables consist of the logarithm of U.S. real GDP growth and the 3-month Treasury bill rate. The domestic variables consist of the logarithm of South African real GDP growth, the logarithm of trade openness, the logarithm of M2 money supply, and the logarithm of institutional quality. Thus these variables identify nine underlying structural shocks: a foreign output shock, a foreign interest rate shock, a domestic output shock, a shock to domestic trade openness, a domestic money supply shock, a shock to domestic institutional quality, and shocks to the capital flow components of FDI, portfolio inflows, and other inflows.⁵

⁵ In recent years the recovery of the structural shocks from the structural VAR has become standard and thus a detailed description can be found in Appendix A.

The previous discussion suggests that South Africa's capital flow components can be modelled as follows:

$$DIL_t = f_1(u_t^{Log-US_RGDPG}, u_t^{US_Thill}, u_t^{Log-SA_RGDPG}, u_t^{Log-SA_Trade}, u_t^{Log-SA_M2}, u_t^{Log-SA_Instq}, u_t^{DIL}, u_t^{PIL}, u_t^{OIL}) \quad (1)$$

$$PIL_t = f_2(u_t^{Log-US_RGDPG}, u_t^{US_Thill}, u_t^{Log-SA_RGDPG}, u_t^{Log-SA_Trade}, u_t^{Log-SA_M2}, u_t^{Log-SA_Instq}, u_t^{DIL}, u_t^{PIL}, u_t^{OIL}) \quad (2)$$

$$OIL_t = f_3(u_t^{Log-US_RGDPG}, u_t^{US_Thill}, u_t^{Log-SA_RGDPG}, u_t^{Log-SA_Trade}, u_t^{Log-SA_M2}, u_t^{Log-SA_Instq}, u_t^{DIL}, u_t^{PIL}, u_t^{OIL}) \quad (3)$$

The structural shocks in equations (1) – (3) are unobservable and thus identifying assumptions are required so as to uncover the underlying shocks because what are observed in the data are combinations of the unobserved structural shocks. A structural VAR (SVAR) approach as developed by Shapiro and Watson (1988), Blanchard and Quah (1989), and Amisano and Giannini (1997) is thus employed to investigate the role of the various push and pull factors affecting the capital flow components. The advantage of the SVAR approach is that by exploiting the long-run properties, only a few arbitrary assumptions are needed to recover the structural shocks (Blanchard and Quah, 1989). To extract the nine structural shocks, a nine-variable system is used that can be specified and uncovered with a $a_{ij}(L)$ lag polynomial form as follows (Ying and Kim, 2001):

$$Y_t = \sum_{i=0}^{\infty} A_i U_{t-i} = A(L)U_t \quad (4)$$

where $Y_t = (\Delta Log_US_RGDPG_t, \Delta US_Thill_t, \Delta Log_SA_RGDPG_t, \Delta Log_SA_Trade_t, \Delta Log_SA_M2_t, \Delta Log_SA_Instq_t, DIL_t, PIL_t, OIL_t)'$,

$U_t = (u_t^{Log-US_RGDPG}, u_t^{US_Thill}, u_t^{Log-SA_RGDPG}, u_t^{Log-SA_Trade}, u_t^{Log-SA_M2}, u_t^{Log-SA_Instq}, u_t^{DIL}, u_t^{PIL}, u_t^{OIL})'$ and

$A(L) = \sum_{i=0}^{\infty} A_i L^i$ where L is the lag operator, A_i is the matrix of impulse responses of endogenous

variables to structural shocks. In order to identify the long-run effects of the structural shocks the following assumptions are used: (a) the foreign variables are only affected by foreign shocks not by shocks relating to the South African economy (shocks run from the international variables to the

South African variables but not the other way around); (b) the domestic variables are affected by the external and the domestic shocks; (c) shocks to all of the variables in the system affect the capital flows in the long run; and (d) shocks to other investment are transitory in nature and do not have long-run effects on the other variables. The matrix of long-run effects of structural shocks is

$\sum_{i=1}^{\infty} A_i = A(I) = \{a_{ij}(1)\}$. In the system of nine variables, the identification of structural shocks, U_t , from reduced form shocks requires 36 restrictions to be just-identified.⁶ Hence the 36 restrictions can be summarised using a lower triangular matrix form as shown in equation (5):

$$\begin{bmatrix} \Delta Log_US_RGDPG_t \\ \Delta US_Tbill_t \\ \Delta Log_SA_RGDPG_t \\ \Delta Log_SA_Trade_t \\ \Delta Log_SA_M2_t \\ \Delta Log_SA_Instq_t \\ DIL_t \\ PIL_t \\ OIL_t \end{bmatrix} = \begin{bmatrix} A_{11}(L) & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ A_{21}(L) & A_{22}(L) & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ A_{31}(L) & A_{32}(L) & A_{33}(L) & 0 & 0 & 0 & 0 & 0 & 0 \\ A_{41}(L) & A_{42}(L) & A_{43}(L) & A_{44}(L) & 0 & 0 & 0 & 0 & 0 \\ A_{51}(L) & A_{52}(L) & A_{53}(L) & A_{54}(L) & A_{55}(L) & 0 & 0 & 0 & 0 \\ A_{61}(L) & A_{62}(L) & A_{63}(L) & A_{64}(L) & A_{65}(L) & A_{66}(L) & 0 & 0 & 0 \\ A_{71}(L) & A_{72}(L) & A_{73}(L) & A_{74}(L) & A_{75}(L) & A_{76}(L) & A_{77}(L) & 0 & 0 \\ A_{81}(L) & A_{82}(L) & A_{83}(L) & A_{84}(L) & A_{85}(L) & A_{86}(L) & A_{87}(L) & A_{88}(L) & 0 \\ A_{91}(L) & A_{92}(L) & A_{93}(L) & A_{94}(L) & A_{95}(L) & A_{96}(L) & A_{97}(L) & A_{98}(L) & A_{99}(L) \end{bmatrix} \begin{bmatrix} U_t^{Log_US_RGDPG} \\ U_t^{US_Tbill} \\ U_t^{Log_SA_RGDPG} \\ U_t^{Log_SA_Trade} \\ U_t^{Log_SA_M2} \\ U_t^{Log_SA_Instq} \\ U_t^{DIL} \\ U_t^{PIL} \\ U_t^{OIL} \end{bmatrix} \quad (5)$$

Prior to formulating the SVAR model, the stationarity and cointegrating properties of the data must be examined so as to avoid misspecification. Hence, the first step of the analysis is to examine the stationarity of the variables. It follows that if some of the variables are stationary in levels while others are non-stationary, then the latter must be included in the SVAR in first-differences so as to avoid problems of spurious regression. Testing for unit roots is conducted using the augmented Dickey-Fuller (ADF) (1979, 1981) and Phillips-Perron (PP) (1988) tests.

The augmented Dickey-Fuller unit root test is based on the following ARMA(p) model (Greene, 2008: 751-752):

$$\Delta y_t = \mu + \beta_t + \gamma y_{t-1} + \gamma_1 \Delta y_{t-1} + \dots + \gamma_p \Delta y_{t-p} + \varepsilon_t \quad (6)$$

The random walk form of equation (6) is then obtained by setting $\mu = 0$ and $\beta = 0$, while the random walk with drift sets $\beta = 0$, and the trend stationary form of the model leaves both

⁶ Obtained from $[(k^2 - k)/2]$, where k is the number of variables.

parameters free. The unit root test is then carried out on the null hypothesis that $\gamma = 0$ versus the alternative hypothesis that $\gamma < 0$ based on the following two t -test statistics:

$$DF_{\tau} = \frac{\hat{\gamma} - 1}{SE(\hat{\gamma})} \quad (7)$$

$$DF_{\gamma} = \frac{T(\hat{\gamma} - 1)}{1 - \hat{\gamma}_1 - \dots - \hat{\gamma}_p} \quad (8)$$

Once the test statistic (DF_{γ}) is computed, the value can be compared to the critical values (DF_{τ}) and if γ is less than the critical value, then the null hypothesis is rejected and no unit root is present.

The Phillips-Perron (1988) unit root test proposes an alternative approach in order to control for serial correlation when testing for a unit root. This method uses a modification of the non-augmented Dickey-Fuller (1979) model based on the following model (Greene, 2008: 752-753):

$$\Delta y_t = \delta_t + \gamma y_{t-1} + \gamma_1 \Delta y_{t-1} + \dots + \gamma_p \Delta y_{t-p} + \varepsilon_t \quad (9)$$

where ε_t is $I(0)$ and may be heteroskedastic. The Phillips-Perron unit root test then corrects for any serial correlation and heteroskedasticity in the errors ε_t of equation (9) using the following modified test statistics:

$$Z_{\tau} = \sqrt{\frac{c_0}{a}} \left(\frac{\hat{\gamma} - 1}{v} \right) - \frac{1}{2} (a - c_0) \frac{Tv}{\sqrt{as^2}} \quad (10)$$

$$Z_{\gamma} = \frac{T(\hat{\gamma} - 1)}{1 - \hat{\gamma}_1 - \dots - \hat{\gamma}_p} - \frac{1}{2} \left(\frac{T^2 v^2}{s^2} \right) (a - c_0) \quad (11)$$

where $s^2 = \frac{\sum_{t=1}^T e_t^2}{T-K}$, v^2 is the estimated asymptotic variance of $\hat{\gamma}$, $c_j = \frac{1}{T} \sum_{s=j+1}^T e_t e_{t-s}$ with $j=0, \dots, p$

being the j th autocovariance of the residuals, $c_0 = \left[\frac{(T-K)}{T} \right] s^2$ and $a = c_0 + 2 \sum_{j=1}^L \left(1 - \frac{j}{L+1} \right) c_j$.

Two advantages of the PP test over the ADF test is that the PP test is robust to general forms of heteroskedasticity in the error term ε_t and there is no need to stipulate a lag length (p) for the test regression.

However, it is relatively common that the ADF and PP unit root tests produce conflicting results. In such cases, the disparity can often be resolved using the stationarity test of Kwiatkowski, Phillips, Schmidt and Shin (1992) (KPSS), which unlike unit root tests, takes the null hypothesis that y_t is $I(0)$ rather than $I(1)$. The KPSS test is derived from the following equation (Lutkepohl and Kratzig, 2004: 63):

$$y_t = \beta' D_t + \mu_t + u_t \quad (12)$$

where $\mu_t = \mu_{t-1} + \varepsilon_t$, $\varepsilon_t \sim i.i.d.(0, \sigma_\varepsilon^2)$, D_t contains the deterministic component, and u_t is $I(0)$ and possibly heteroskedastic. The KPSS then tests for stationarity using the following Legrange multiplier (LM) test statistic:

$$KPSS = \frac{\left(T^{-2} \sum_{t=1}^T \hat{S}_t^2 \right)}{\hat{\lambda}^2} \quad (13)$$

where $\hat{S}_t = \sum_{j=1}^t \hat{u}_j$, \hat{u}_j is the residual of the regression of y_t on D_t and $\hat{\lambda}^2$ is an estimate of the long-run variance of u_t based on \hat{u}_t .

After examining the stationarity of the series, it may be necessary to test for cointegration because if two or more series are $I(1)$ integrated then it is possible that they share a long-run cointegrated relationship (Engle and Granger, 1987). Hence, after examining the stationarity of the series, the second step of the analysis is to test for cointegration. This is undertaken using the

maximum likelihood cointegration tests of Johansen (1995), which is based on the error correction representation of:

$$y_t = \Pi y_{t-k} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-k} + u_t \quad (14)$$

where $\Pi = \left(\sum_{i=1}^k \beta_i \right) - I_p$ and $\Gamma_i = \left(\sum_{j=1}^i \beta_j \right) - I_p$, p is the number of variables in first-differenced form, Π and Γ represent the coefficient matrices, k denotes the lag length, and u_t is the i.i.d. disturbance term. The residuals from the estimated equation (14) are then tested to identify the unique cointegrating vectors of y_t using two likelihood ratios test statistics that examine the rank of the Π matrix via its eigenvalues (λ).

The first test statistic, known as the trace test statistic, λ_{trace} , considers the null hypothesis that the rank of Π is less than or equal to r (where r is the number of cointegrating vectors) based on the following:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^p \ln(1 - \hat{\lambda}_i) \quad (15)$$

where $\hat{\lambda}_i$ is the estimated value of the i th ordered eigenvalue from the Π matrix and T is the number of observations. The second test statistic is known as the maximal eigenvalue test statistic, λ_{max} , and tests the null hypothesis that there are exactly r cointegrating vectors in y_t based on the following:

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (16)$$

After examining the stationarity of the variables and the number of cointegrating relationships, the SVAR model is then produced and the dynamic effects of the structural shocks are investigated using impulse response and variance decomposition analysis.

An impulse response function traces out the effect of a shock to one variable through the system using a Wold moving average representation from a k -dimensional VAR as follows (Lutkepohl and Kratzig, 2004: 165-166):

$$y_t = \Phi_0 u_t + \Phi_1 u_{t-1} + \Phi_2 u_{t-2} + \dots, \text{ where } \Phi_0 = I_K \text{ and } \Phi_s = \sum_{j=1}^s \Phi_{s-j} A_j \text{ with } s=1, 2, \dots, \quad (17)$$

Hence, since the change in y_{it} is measured by the innovation u_{it} , the impulse responses of the components of y_t with respect to the u_t innovations are represented by Φ_s . Thus, $\Phi_{ij,s}$ traces out the response of variable i to a unit impulse in variable j occurring s periods ago.

Variance decompositions separate the variance that each variable contributes to the system. The variance decomposition can once again be described from the following moving average representation of a VAR equation (Cronin, 2010: 221-222):

$$Z_t = \sum_{j=0}^{\infty} A_j u_{t-j} \quad (18)$$

where the matrices of A_j are computed recursively as:

$$A_j = \varphi_1 A_{j-1} + \varphi_2 A_{j-2} + \dots + \varphi_p A_{j-p} \quad (19)$$

Hence, the predictive forecast error of Z_{t+N} at time $t-1$ is then given by:

$$\xi_t(N) = \sum_{l=0}^N A_l u_{t+N-l} \quad (20)$$

and the total forecast error covariance matrix is given by:

$$Cov(\xi_t(N)) = \sum_{l=0}^N A_l \sum A_l' \quad (21)$$

Thus, the N -step ahead generalised forecast error variance of the i th variable in Z_t is then decomposed as follows:

$$\psi_{ij,N} = \frac{\sigma_{ii}^{-1} \sum_{l=0}^N \left(e_j' A_l \sum e_i \right)^2}{\sum_{l=0}^N e_i' A_l \sum A_l' e_i} \quad (22)$$

2.5 DATA DESCRIPTION

The analysis conducted in this study makes use of quarterly data that runs from South Africa's financial liberalisation in the second quarter of 1995 to the end of 2007. The nine variables included in the SVAR model consist of two foreign (push) factors, four domestic (pull) factors, and three capital flow components.

The capital inflow (liability) data comprises FDI inflows (*DIL*), portfolio investment inflows (*PIL*), and other investment inflows (*OIL*). In this study, the capital flows are measured in millions of Rands and have not been normalised to GDP. The reason for this is that if the analysis includes normalised capital flows, then the results may reflect the responses of GDP as well, and thus lead to ambiguous results. In addition, in order to compensate for the capital flow outliers associated with the Anglo-American-De Beers unwinding in the second quarter of 2001, the analysis includes an exogenous dummy variable. The capital inflow data was obtained from the South African Reserve Bank.

The two foreign (push) factors included in this study consist of foreign productivity and international interest rates, which have been found to be the most significant push factors in the push-pull literature (Calvo *et al.*, 1993; Fernandez-Arias, 1996; Taylor and Sarno, 1997). Foreign productivity is proxied by the logarithm of U.S. 4-quarter real GDP growth (*Log_US_RGDPG*) and foreign interest rates are proxied by the interest rate on the 3-month U.S. Treasury bill (*US_Tbill*). The U.S. real GDP data was obtained from the National Bureau of Economic Research (NBER) and the 3-month U.S. Treasury bill rate was obtained from the Federal Reserve Bank of America.

The domestic (pull) factors included in this study have been selected in accordance with the push-pull literature. Hence, domestic economic growth as measured by the logarithm of domestic seasonally adjusted 4-quarter real GDP growth (Log_SA_RGDPG) is included as a proxy for economic activity (Kim, 2000). Openness as measured by the logarithm of trade openness (Log_SA_Trade)⁷ is included as a proxy for global integration (Williamson, 1993). Money supply as measured by the logarithm of M2 (Log_SA_M2) is included as a proxy for credit and liquidity (Bekaert, 1995; Calvo *et al.*, 1996; Lensink and White, 1998). Lastly, institutional quality is measured by the logarithm of the PRS index of institutional quality (Log_SA_Instq)⁸ (Alfaro *et al.*, 2008; Law and Demetriades, 2006). Hence, shocks to these four pull factors are anticipated to impact the capital inflows to South Africa as follows: a shock to domestic output is anticipated to impact capital inflows by affecting returns on investment and domestic risk profiles; a shock to trade openness is anticipated to impact capital inflows by affecting the ease of fixed and financial investment (Aizenman, 2008; Aizenman and Noy, 2004); a shock to money supply is anticipated to have an impact on capital inflows by affecting the outlook for inflationary policy (Filer, 2004); and a shock to institutional quality is anticipated to impact the capital inflows by affecting trust in domestic policy choices. All of the pull factor data was obtained from the South African Reserve Bank.⁹

2.6 EMPIRICAL RESULTS

The results of the unit root tests are presented in Table 2-1 overleaf and show that all of the push-pull variables are I(1) stationary while DIL and PIL are I(0) stationary. In the case of OIL , the results are inconclusive. OIL is I(1) stationary according to the ADF test but I(0) stationary according to the PP test. However, so as to avoid introducing non-contemporaneous capital inflow elements into the SVAR model, OIL is included as I(0) stationary as well. Hence, all of the variables in the SVAR model are included in first-differences except for the capital inflows, which are included in levels.

⁷ Trade openness is measured as the sum of real seasonally adjusted exports and imports as a percentage of real seasonally adjusted GDP.

⁸ This series was derived by taking the logarithm of the summation of the three indices of Bureaucratic Quality, Level of Corruption, and Law and Order as produced by the PRS Group database.

⁹ The push-pull data is graphically presented in Appendix 2-B.

Table 2-1: Unit Root Test Results

Variable	ADF with Constant		PP with Constant	
	I(0)	I(1)	I(0)	I(1)
<i>Capital Inflows:</i>				
DIL	-6.191 ***	-7.809 ***	-6.151 ***	-23.492 ***
PIL	-4.594 ***	-5.943 ***	-4.560 ***	-26.852 ***
OIL	-0.658	-8.197 ***	-4.932 ***	-15.000 ***
<i>Push Factors:</i>				
Log(US_RGDPG)	-2.874 *	-4.513 ***	-2.075	-5.944 ***
US_Tbill	-2.025	-2.739 *	-1.682	-2.913 **
<i>Pull Factors:</i>				
Log(SA_RGDPG)	-2.929 **	-4.663 ***	-2.164	-4.531 ***
Log(SA_Trade)	-0.457	-6.224 ***	-1.969	-11.766 ***
Log(SA_M2)	0.827	-5.639 ***	0.829	-6.071 ***
Log(SA_Instq)	-2.136	-7.216 ***	-2.136	-7.212 ***

The ADF and PP tests both include a constant. The ADF unit root test include a maximum of 4 lags chosen on the basis of the Akaike Information Criterion (AIC). ***, **, and * represent significance at the 1%, 5%, and 10% levels respectively.

Next, testing for cointegration among the non-stationary variables is undertaken using the Johansen (1995) cointegration test. The results set out in Table 2-2 show that the null hypothesis of no cointegrating relationships among the non-stationary variables can be rejected at the 5% level with a trace statistic of 98.359 (which is greater than the 5% critical value of 95.754) but cannot be rejected at the 5% level with the Max-Eigen statistic of 34.922 (which is smaller than the 5% critical value of 40.078). Thus, the Max-Eigen cointegration test indicates that one of the structural shocks possibly only has short-run effects on the other variables.

Table 2-2: Cointegration Test Results

Trace Test					Max Eigenvalue Test			
No. of CE(s)	λ	Trace	5% C.V.	Prob.	No. of CE(s)	Max-Eigen	5% C.V.	Prob.
None *	0.510	98.359	95.754	0.033	None	34.922	40.078	0.170
At most 1	0.415	63.437	69.819	0.145	At most 1	26.289	33.877	0.303
At most 2	0.319	37.148	47.856	0.341	At most 2	18.858	27.584	0.426
At most 3	0.168	18.290	29.797	0.545	At most 3	9.018	21.132	0.831
At most 4	0.150	9.271	15.495	0.341	At most 4	7.968	14.265	0.382
At most 5	0.026	1.304	3.841	0.254	At most 5	1.304	3.841	0.254

Lags interval (in first differences): 1 to 1 based on the Schwartz Information Criteria (SIC). Identification of the significant cointegrating equation is based on the critical values of MacKinnon-Haug-Michelis (1999).

Having gained insight into the stationary and cointegrating behaviour of the variables, the next step of the analysis is to produce the SVAR model, which was achieved using an optimal lag length of 1 lag based on the Schwartz (SIC) and Hannan-Quinn (HQ) Information Criteria. Stability of the model is then established using standard diagnostic tests. The plots of the inverse roots of AR characteristic polynomials presented in Figure 2-3 indicate that the SVAR model is stable. In addition, the multivariate Box-Pierce/Ljung-Box Q-statistics and adjusted Q-statistics, as well as the LM-Test statistics presented in Table 2-3 show that there is no significant residual serial correlation. Thus, having determined that the empirical model is correctly specified, the push-pull dynamics of the capital flows are assessed using impulse responses and variance decompositions.

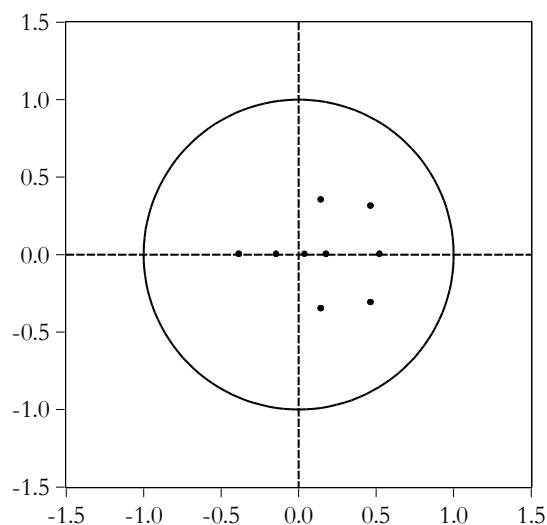
Figure 2-3: Inverse Roots of AR Characteristic Polynomials

Table 2-3: SVAR Diagnostics

Residual Portmanteau Tests					LM Tests		
Lag	Q-Stat.	Prob.	Adj Q-Stat	Prob.	Lag	LM-Stat	Prob.
2	96.619	1.000	100.137	1.000	1	67.885	0.851
4	255.085	0.995	271.019	0.968	2	65.881	0.888
8	547.283	0.997	608.574	0.809	3	77.638	0.585
12	773.696	1.000	897.077	0.939	4	104.266	0.042

2.6.1 Impulse Response Results

The impulse responses are set out in Table 2-4 and show that the push-pull shocks have varied impacts on the capital flow components. With regards to FDI, both push factors are found to have relatively insignificant effects compared to the impacts of pull factor shocks. The most significant factor is found to be a money supply shock, which is associated with a R2.8 billion positive impact followed by a shock to institutional quality, which has a positive R2.1 billion effect. In contrast, shocks to trade openness and domestic output both have negative impacts on FDI (R1.0 billion and R1.6 billion respectively). Hence, these results suggest that South Africa's FDI inflows are impacted most significantly by pull factor shocks. In addition, the significant and positive effects of money supply and institutional quality suggest that international investors are primarily concerned with inflation and policy stability, which possibly reflects the equity-based nature of South Africa's FDI inflows.

In contrast to FDI, the impulse responses show that portfolio investment is impacted by both push and pull factor shocks. With regards to the push factors, foreign interest rate shocks have the most significant impact on portfolio inflows, resulting in a R10.7 billion positive effect compared to a negative R7.2 billion effect from a foreign output shock. With regards to the pull factors, a shock to money supply has a disproportionately significant effect compared to the other pull factors. A money supply shock is associated with a positive R8.9 billion effect while shocks to institutional quality, domestic output and trade openness are associated with a negative R3.0 billion, a positive R2.9 billion, and a positive R2.3 billion impact respectively. The significance of the push factors suggests that in accordance with the push-pull literature, heightened foreign economic growth and lower foreign interest rates drive portfolio investment to South Africa, while the significance of domestic money supply indicates that the capital inflows are attracted by expectations of low inflation.

Other investment inflows are also found to be significantly impacted by both push and pull shocks and as in the case of portfolio inflows, foreign interest rate shocks are found to have the most significant effect followed by domestic money supply shocks. Foreign interest rate shocks are associated with a R5.6 billion positive effect while domestic money supply shocks are associated with R5.3 billion effect. Thereafter, the most significant factor is institutional quality, which is associated with a R4.3 billion positive effect. The remaining factors of foreign output, domestic output, and trade openness do not have significant impacts on other investment inflows (being associated with a negative R415 million, a positive R482 million, and a positive R789 million impact respectively).

Hence, similar to portfolio inflows, these results suggest that other investment inflows are pushed to South Africa by lower foreign interest rates and pulled by domestic price stability. However, the significance of the institutional quality shock suggests that in common with FDI inflows, international investors also take cognisance of policy stability. Furthermore, the finding that institutional quality shocks have a more significant impact than trade openness is in contrast to studies such as Rajan and Zingales (1998), Beck *et al.* (2000), and Islam and Montenegro (2002) who find that trade openness leads to financial development and thus institutional quality. Hence, this result tends to support the assertion of Demetriades and Andrianova (2003), who argue that institutional quality takes precedence as it determines the success or failure of financial reforms and thus reflects investor confidence.

Thus in summary, the impulse responses show that South Africa's FDI inflows are most significantly impacted by pull factor shocks, while portfolio and other inflows are impacted by a combination of push and pull factor shocks.

Table 2-4: Impulse Responses

Quarter	Push		Pull				Capital Flows		
	D(Log_US_RGDPG)	D(US_Tbill)	D(Log_SA_RGDPG)	D(Log_SA_Trade)	D(Log_SA_M2)	D(Log_SA_Instq)	DIL	PIL	OIL
<i>Response of DIL:</i>									
1	2.090	796.225	-830.068	-1937.508	1145.198	1850.055	5243.287	-1291.248	316.216
4	541.609	261.272	-1057.033	-1618.085	2772.765	2052.752	6531.045	-118.596	-125.275
8	348.169	513.078	-1070.478	-1578.811	2886.012	2152.824	6554.893	-7.838	-2.453
12	334.882	571.170	-1044.274	-1580.428	2887.927	2154.080	6557.029	-0.800	-0.843
16	335.675	569.892	-1043.622	-1579.991	2888.687	2155.064	6556.706	-0.076	-0.022
20	335.488	570.186	-1043.689	-1579.972	2888.753	2155.042	6556.750	-0.002	-0.001
<i>Response of PIL:</i>									
1	-873.362	2563.897	-1247.145	2870.822	3304.786	-2302.615	3615.747	10022.530	-2324.073
4	-6708.283	8389.719	2120.427	2157.682	8599.039	-3281.586	3961.780	14799.490	-259.267
8	-7144.415	10627.300	2803.342	2315.230	8841.886	-2952.721	4110.265	15294.350	-31.962
12	-7155.311	10702.470	2859.413	2330.145	8869.378	-2915.122	4107.329	15331.390	-1.972
16	-7159.959	10712.190	2860.512	2331.263	8872.301	-2914.020	4108.134	15334.890	-0.117
20	-7160.109	10713.230	2861.090	2331.276	8872.378	-2913.883	4108.150	15335.080	-0.019
<i>Response of OIL:</i>									
1	2188.153	1685.292	774.426	-883.830	1407.866	2192.048	706.357	3629.389	5822.679
4	563.302	3001.929	33.746	747.144	5017.005	4224.455	1363.601	8059.543	7431.198
8	-432.122	5503.378	376.330	784.861	5330.631	4259.360	1578.394	8527.514	7633.069
12	-411.509	5593.846	486.852	787.722	5339.709	4296.306	1568.430	8551.184	7655.102
16	-414.555	5592.027	482.224	789.937	5344.268	4298.024	1568.765	8555.092	7658.066
20	-415.106	5594.092	482.855	789.854	5344.235	4297.949	1568.903	8555.238	7658.015

Factorization: Structural

2.6.2 Variance Decomposition Results

The variance decompositions are presented in Table 2-5 and show that a significant portion of the variance is explained by the capital flows themselves. However, the variance of FDI is not significant among portfolio inflows and vice-versa, suggesting that there is little substitution effects between these capital flow components. In contrast, 25% of the variance of other inflows is explained by portfolio inflows, suggesting that there is possible substitution from portfolio inflows to other inflows but not in the reverse direction.

With regards to FDI, the push factors are found to be insignificant in comparison with the pull factors, with foreign output explaining just 1.1% and foreign interest rates explaining just 2.1% of the variance. The most significant factor is found to be trade openness (8.8%), followed by institutional quality (8.5%) and then money supply (5.3%). Domestic output is the least significant (1.8%) of all the pull factors. Hence, these results indicate that FDI investment in South Africa has been shaped by pull factors, which suggests that domestic policy mechanisms that include increased trade liberalisation, strengthening of private and public institutions, and price stability could possibly attract further FDI inflows to South Africa.

The variance of portfolio inflows is found to be explained most significantly by a domestic money supply shock (13.4%), followed by a foreign interest rate shock (8.1%), and then by a foreign output shock (5.9%). The remaining pull factors of trade openness, institutional quality, and domestic output are relatively insignificant (accounting for 4.7%, 4.6% and 2.7% respectively). Thus, the results of the variance decompositions show that portfolio inflows are pulled to South Africa by expansionary financial activity, but pushed to the country by declining foreign interest rates and rising foreign economic growth prospects.

Similar to portfolio inflows, the variance of other inflows is explained by a combination of push and pull factors. However, unlike portfolio inflows, the most significant pull factor is found to be institutional quality (9.2%), followed by money supply (7.6%), then by foreign output (7.3%) and foreign interest rate shocks (5.9%). The remaining pull factors of domestic output and trade openness are relatively insignificant (1.3% and 2.2% respectively) in explaining the variance of other inflows. Hence, these results suggest that South Africa's short-term capital inflows are pulled by the country's financial sophistication¹⁰ and pushed by foreign output and interest rate movements.

¹⁰ Fedderke (2010) finds that South Africa has a disproportionately large financial sector compared to many other emerging countries.

The variance decompositions thus show that South Africa's FDI inflows are primarily affected by pull factors, while portfolio and other inflows are affected by pull factors and, to a lesser extent, by push factors as well.

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Table 2-5: Variance Decompositions

Quarter	Push		Pull				Capital Flows		
	D(Log_US_RGDPG)	D(US_Tbill)	D(Log_SA_RGDPG)	D(Log_SA_Trade)	D(Log_SA_M2)	D(Log_SA_Instq)	DIL	PIL	OIL
<i>Percentage of variations in DIL flows:</i>									
1	0.000	1.623	1.764	9.608	3.357	8.760	70.365	4.267	0.256
4	1.139	2.161	1.846	8.723	5.428	8.519	65.937	5.112	1.135
8	1.165	2.199	1.845	8.714	5.434	8.521	65.854	5.114	1.153
12	1.165	2.202	1.846	8.714	5.434	8.521	65.852	5.114	1.153
<i>Percentage of variations in PIL flows:</i>									
1	0.501	4.317	1.021	5.412	7.172	3.482	8.585	65.963	3.547
4	6.384	7.954	2.881	4.695	13.733	4.685	5.749	50.474	3.443
8	6.351	8.743	2.913	4.653	13.595	4.664	5.694	49.972	3.414
12	6.351	8.744	2.914	4.653	13.595	4.664	5.694	49.971	3.414
<i>Percentage of variations in OIL flows:</i>									
1	7.555	4.482	0.946	1.233	3.128	7.582	0.787	20.786	53.500
4	7.245	4.353	1.335	2.349	8.146	9.440	0.803	25.635	40.694
8	7.482	6.419	1.346	2.282	7.977	9.165	0.799	24.988	39.541
12	7.481	6.427	1.352	2.282	7.975	9.164	0.799	24.984	39.535

Factorization: Structural

2.7 CONCLUSION

Empirical studies undertaken over the last two decades have shown that capital flow movements can be explained by a combination of foreign (push) and domestic (pull) factors. This study applied a structural VAR model with impulse response and variance decomposition analysis to investigate whether South Africa's capital inflows have been driven by push or pull factors after the country's financial liberalisation in March 1995.

The results show that South Africa's FDI inflows are most significantly impacted by pull factor shocks, while portfolio and other inflows are impacted by pull factors and to a lesser extent, by push factors as well. Hence, with regards to FDI, the results suggest that on the one hand, South Africa's policymakers can use policy mechanisms to shape the FDI flows; but on the other hand, the result implies that the country's limited success in attracting FDI inflows arises from the ineffective implementation of pull factor policies and is thus a 'self-inflicted wound.' In the case of portfolio and other inflows, the findings show that the country's 'hot' flows are impacted by global business cycle dynamics and thus domestic policy mechanisms may only be partially effective in attracting the capital flows and mitigating their detrimental impacts.

APPENDICES

Appendix 2-A: The SVAR Model

To recover the structural moving average representation from equation (4) in the text,

$Y_t = \sum_{i=0}^{\infty} A_i U_{t-i} = A(L)U_t$ it is necessary to first estimate the following reduced form VAR model

(Ying and Kim, 2001: 967):

$$B(L)Y_t = V_t \quad (\text{A.1})$$

The moving average representation is thus:

$$Y_t = B(L)^{-1} V_t = C(L)V_t \quad (\text{A.2})$$

The identity matrix, $C(0)=I$, is the leading coefficient matrix, $C(0)$, that captures the contemporaneous effects of the reduced form shocks. Comparing the structural moving average representation of equation (4) with equation (A.2) indicates that:

$$U_t = A_0^{-1} V_t \quad (\text{A.3})$$

where $A_0 = A(0)$ is the leading coefficient matrix in $A(L)$. In addition:

$$A_i = A_0^{-1} C_i \quad (\text{A.4})$$

where A_i and C_i are coefficients matrices of $A(L)$ and $C(L)$. Since C_i is the derived moving average representation of the reduced form VAR, the A_i 's and structural representations are obtained only if the A_0 matrix is known. Hence to find A_0 it is important to note that:

$$A_0 S A_0' = A_0 A_0' = \Omega \quad (\text{A.5})$$

where Ω is a variance matrix of the reduced form model, $\Omega = \text{Var}(V_t)$, and $S = \text{Var}(U_t)$, which is normalised to the identity matrix. In addition:

$$A(1)A(1)' = C(1)\Omega C(1)' \quad (\text{A.6})$$

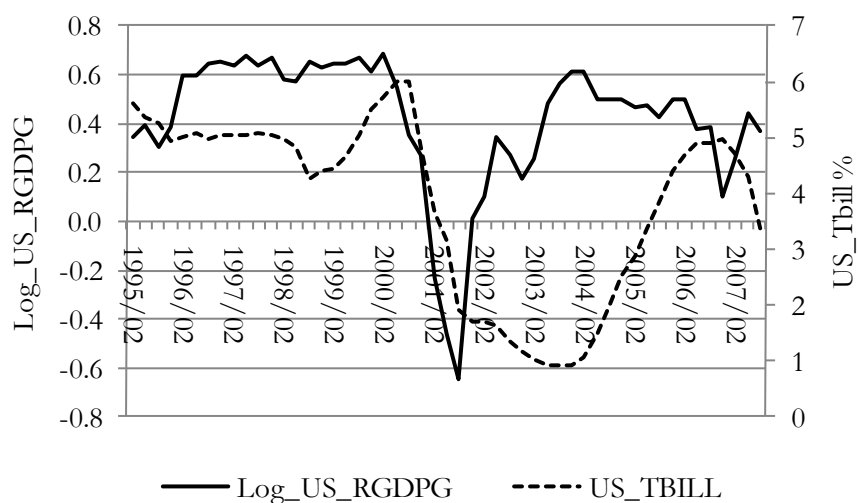
where $C(1)$ inherits the properties of $A(1)$. Because $A(1)$ is a lower triangular matrix from the long-run restrictions, $A(1)$ can be obtained as a Cholesky decomposition of the $C(1)\Omega C(1)'$ matrix. Hence, once the $A(1)$ matrix is derived, the A_0 matrix is obtained by:

$$A_0^{-1} = A(1)C(1)^{-1} \quad (\text{A.7})$$

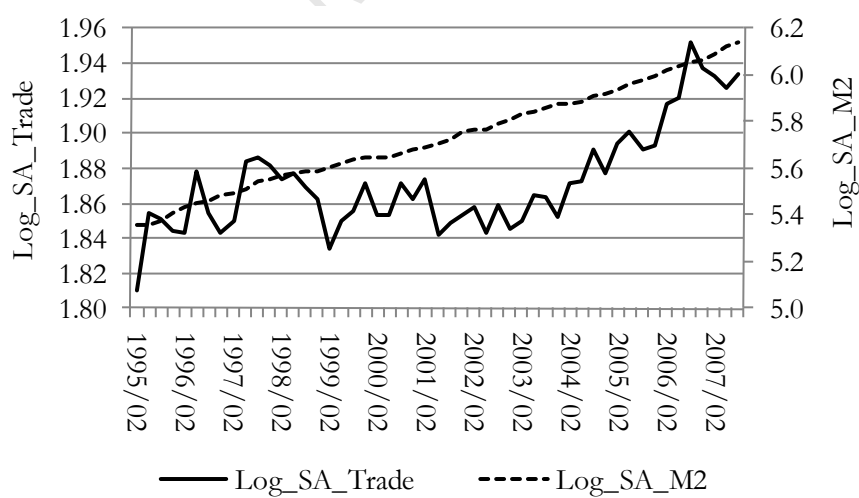
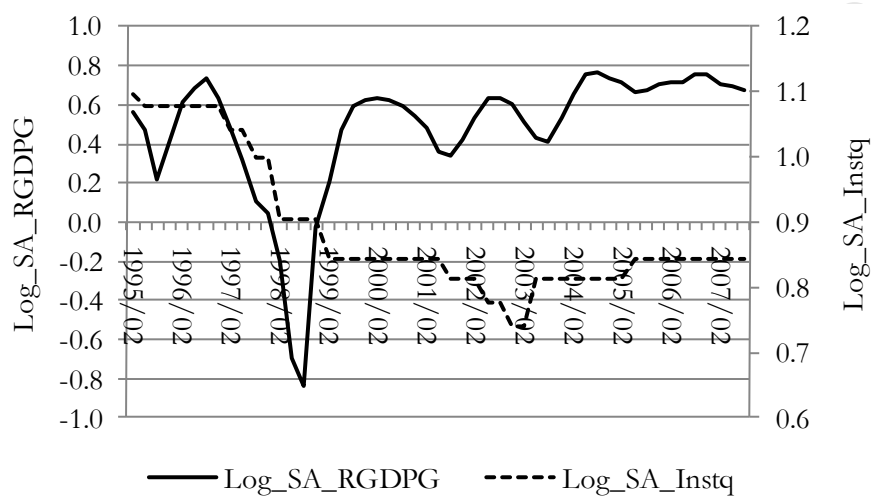
The structural shocks can then be obtained from equation (A.3) and the structural moving average coefficients from equation (A.4).

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Appendix 2-B: Push Factors



Appendix 2-C: Pull Factors



CHAPTER 3

THE CYCLICAL RELATIONSHIPS BETWEEN SOUTH AFRICA'S CAPITAL FLOWS AND BUSINESS CYCLE FLUCTUATIONS

3.1 INTRODUCTION

In an increasingly globalised world, international trade and financial linkages have resulted in macroeconomic spillovers coupled with the synchronisation of business cycles (Kose *et al.*, 2003 and 2008). These developments in turn, have implications for global capital flows. During an expansionary phase in source countries, changes in interest rates and heightened economic growth typically 'push' capital to recipient countries (Calvo *et al.*, 1993 and 1996; Fernandez-Arias, 1996; Chohan *et al.*, 1998). Hence, these dynamics could potentially pressurize policy makers in recipient countries to adopt reactive, procyclical policy mechanisms to moderate the adverse impacts of the capital inflows.

The capital can also be 'pulled' into the recipient countries that can offer better returns and investment opportunities, depending on country-specific factors such as low country risk premiums (Neumeyer and Perri, 2005), disciplined fiscal policies (Schadler *et al.*, 1993), openness to trade (Williamson, 1993), good creditworthiness (Bekaert, 1995), and robust private consumption (Calvo and Vegh, 1999). Thus, in this case, policy makers in recipient countries are better positioned to proactively adopt counter-cyclical policy choices that will attract and control the capital flows.

In contrast, during a contractionary phase, cash flows in source countries will typically shrink and as a result there will be less capital available for outbound investment. In addition, if the downturn occurs in both source and recipient countries, then risk-aversion will increase due to heightened uncertainty and declining returns, which will further stimulate capital outflows. Thus, capital outflows may be due to the repatriation of foreign investment or domestic investment in search of improved returns abroad (Broner *et al.*, 2011). Hence, these dynamics could potentially complicate the policy choices available to policy makers in recipient countries, suggesting that the policy choices available during expansionary phases may not be relevant or appropriate during contractionary phases of global and domestic business cycles.

Studies of South Africa's business cycles are relatively extensive,¹¹ however to date there is no study that explicitly investigates the cyclical relationships between the country's disaggregated capital flows and business cycles. Hence this study uses Christiano-Fitzgerald (2003) filtered correlation analysis to answer three questions: (i) are the relationships between the capital flows and domestic business cycle fluctuations procyclical, counter-cyclical or acyclical; (ii) are the relationships contemporaneous; and (iii), do the phases of the business cycle matter for the cyclicity of the capital flows? The remainder of this chapter is organised as follows: Section 3.2 reviews the applicable literature; Section 3.3 explains the methodology employed; Section 3.4 briefly describes the data utilised; in Section 3.5 the results of the empirical analysis are presented and discussed, and the chapter concludes with a summary of the findings in Section 3.6.

3.2 LITERATURE REVIEW

Over the last three decades, a large body of literature has been devoted to the cyclical behaviour of capital flows. However, to date a relatively small proportion of these studies have examined the cyclical relationships between capital flows and business cycle fluctuations, and even fewer studies have focussed on gross capital flows rather than net capital flows (Broner *et al.*, 2011).¹²

Among the most comprehensive studies of the cyclical relationships between capital flows and business cycles are Kaminsky *et al.* (2004), Contessi *et al.* (2008), and Broner *et al.* (2011). Kaminsky *et al.* (2004) investigates the correlations between net capital inflows and business cycles of 104 developed and emerging countries covering the period from 1960 to 2003. The results show that capital inflows have a procyclical relationship with the business cycle. Thus Kaminsky *et al.* conclude that for emerging countries, the capital flow cycle tends to reinforce rather than stabilise the business cycle. Contessi *et al.* (2008) explore the cyclical relationships of the capital flows on a net and gross capital flow basis using a sample of 22 OECD and emerging countries covering the period from 1992 to 2005. The results show that for both developed and emerging countries, net inflows are procyclical, while net outflows are counter-cyclical. However, on a gross capital flow basis, it is found that FDI inflows are procyclical in developed countries but counter-cyclical in emerging countries, while FDI outflows are procyclical for developed countries. Portfolio inflows are found to be procyclical for developed countries (G7) while other inflows are procyclical for most countries.

¹¹ For example see Boshoff (2005); du Plessis (2004 and 2006); du Plessis *et al.* (2007); du Plessis and Smit (2008), and Moolman (2004).

¹² Net capital flows are measured as the difference between gross capital flows.

Thus, Contessi *et al.* conclude that the capital flow components react differently to business cycle fluctuations. Broner *et al.* (2011) analyse the gross capital flows of foreign and domestic agents over the business cycle of 103 countries covering the period of 1970 to 2009. The results show that gross capital flows tend to be more volatile than net flows. In addition, it is found that gross capital flows are procyclical during expansionary phases such that when foreigners invest in a recipient country, domestic investors tend to invest abroad. In contrast, during contractionary phases, there is a decline in capital inflows by foreign investors and capital outflows by domestic investors. Hence Broner *et al.* conclude that their empirical evidence contradicts the view that capital flows are primarily driven by productivity shocks because such shocks should result in similar behaviour among both domestic and foreign investors.

Additional studies have reported variations in the cyclical relationships arising from regional differences, as well as from capital flow specific factors. Alper (2002) uses cross-correlations with four quarter lags and leads to explore the cyclical relationships between the capital inflows and business cycles of Mexico, Turkey, and the U.S. over the period from 1987 to 2000. The results show that in Mexico and Turkey, net short-term inflows lead the business cycle by one quarter while gross long-term inflows lead the business cycle by one quarter in Mexico and by two quarters in Turkey. In contrast, the capital inflows in the U.S. are found to be acyclical. Thus Alper concludes that Mexico and Turkey are affected by supply-side shocks to a greater extent than by demand-side shocks.

With regards to the dynamics of FDI, Levy-Yeyati *et al.* (2007) examine the cyclical North-South FDI flows among 22 source and 56 recipient countries over the period from 1980 to 1999. After aggregating the FDI flows into three source regions (U.S., Europe, and Japan), it is found that FDI outflows from the U.S. and Europe are counter-cyclical but procyclical from Japan. In accordance with the push-pull literature, interest rates in the U.S. and Europe are found to have a significant impact on FDI, whereby FDI outflows decrease as the interest rates in source countries increase. Furthermore, it is found that FDI outflows and investment in recipient countries are negatively correlated. Thus, the results show that FDI will flow to recipient countries in search of increased returns when interest rates in source countries decline, and that FDI and domestic investment are substitutes. Frenkel *et al.* (2004) study the bilateral FDI flows between developed countries and 22 emerging countries over the period from 1992 to 2000. The results similarly show that business cycles in source countries positively impact FDI flows to recipient countries. In addition, the results show that FDI flows to recipient countries are inversely related to the distance between source and recipient country, and that these flows are dependent on the pull factors of GDP growth and risk levels.

With regards to portfolio investment, Erb *et al.* (1994) find that the correlations of equity prices in the G7 countries over the period from 1970 to 1993 are significantly impacted by the phases of the business cycle. In addition, international equities are found to be more significantly correlated with business cycles during synchronous contractionary phases than during synchronous expansionary phases, or when the cross-country business cycles are out of phase. Longin and Solnik (1995) study the excess returns of the G7 countries over the period from 1960 to 1990 and find that the business cycle factors of dividend yields and interest rates have increasingly impacted international equity correlations in recent decades, especially during periods of heightened volatility.

In contrast, King *et al.* (1994) finds that only a small portion of the covariance between the stock markets of 16 developed countries can be accounted for by economic fundamentals during the years from 1970 to 1988. Hence, they conclude that economic fluctuations do not significantly explain the movements of global equities. Ammer and Mei (1996) develop a framework to measure financial and real economic integration using financial data from the U.S. and U.K. over the period from 1957 to 1989. In addition, in order to assess whether there has been heightened integration after the abandonment of the Bretton Woods arrangement, the study also uses two sub-samples covering the periods from 1957 to 1972 and from 1979 to 1989. The results show that equity risk premiums rather than economic fluctuations are the principle source of stock variance in both countries, and that real and financial linkages are more pronounced in the period after the Bretton Woods arrangement was abandoned. More recently, Kizys and Pierdzioch (2006) examine the link between equity correlations and the co-movement of business cycles in the G7 countries over the period from 1970 to 2004. The results show that international equity correlations are only weakly linked to the co-movement of business cycles. Further analysis also finds that bilateral U.S.-U.K. equity correlations may respond more significantly to asymmetric macroeconomic shocks over the phases of the business cycle. Hence, Kizys and Pierdzioch conclude that equity correlations may be more significantly linked to economic fundamentals than to business cycles.

3.3 METHODOLOGY

In accordance with the deviation cycle literature of Agenor *et al.* (2000), cycles in this study refer to fluctuations around a trend. Hence, separation of the cyclical component of each time series from the trend component is achieved using a filtering technique. The three most common filters are the Hodrick-Prescott (1997), Baxter-King (1999) and Christiano-Fitzgerald (2003) filters.

The Hodrick-Prescott (HP) filter decomposes a time series, y_t , into a trend component, μ_t , and an additive cyclical component, c_t , such that:

$$y_t = \mu_t + c_t \quad (1)$$

The HP filter then computes the smoothed series of μ_t by minimizing the variance of the cyclical component c_t subject to a penalty (λ) that constrains the second difference of the trend component. The trend component is then determined from the following equation (Massmann *et al.*, 2003: 100):

$$\text{Min } \mu_t = \sum_{t=-\infty}^{\infty} \left[(y_t - \mu_t)^2 + \lambda [(\mu_{t+1} - \mu_t) - (\mu_t - \mu_{t-1})]^2 \right] \quad (2)$$

Thus the larger the value of λ , the smoother the growth component. For quarterly data, Hodrick and Prescott propose setting λ to 1600. Solving equation (2) then finds that $c_t = a(L)y_t$ where:

$$a(L) = \frac{\lambda L^{-2} (1-L)^4}{\lambda L^{-2} (1-L)^4 + 1} \quad (3)$$

Thus with a HP filter, an integrated time series can be rendered stationary up to the fourth order since the HP filter has four differencing operators,

However, Baxter and King (1999) argue that choosing λ can be problematic when studying cycles of different periodicities. Hence they propose an alternative filter that is designed to extract stochastic cyclical components with a specified range of periodicities between 1.5 and 8 years (or between 6 and 32 quarters). The Baxter-King (BK) filter is an approximation of the 2-sided infinite moving-average ideal band-pass filter (Murray, 2003: 473-474):

$$a(L) = \sum_{k=-\infty}^{\infty} a_k L^k \text{ where } L \text{ is the lag operator} \quad (4)$$

Unfortunately, the application of the ideal filter in equation (4) is not feasible since it requires an infinite amount of data and thus Baxter and King propose the following truncated version of the ideal filter:

$$a_K(L) = \sum_{k=-K}^K a_k L^k \quad (5)$$

The corresponding transfer function for annual stationary data, $a_K(\omega)$, takes the form:

$$a(\omega) = \begin{cases} 1 & \text{if } \pi/16 \leq |\omega| \leq \pi/3 \\ 0 & \text{otherwise} \end{cases} \quad (6)$$

and thus the BK filter sacrifices $2K$ data points. The frequency response of the filter is constrained to zero at zero frequency and thus renders trending series stationary by the following factorisation:

$$a_K(L) = -(1-L)(1-L^{-1})\psi_{K-1}(L) = L^{-1}(1-L)^2\psi_{K-1}(L) \quad (7)$$

where $\psi_{K-1}(L) = \sum_{b=-(K-1)}^{K-1} \psi_b L^b$ and the coefficients of $\psi_{K-1}(L)$ are given by $\psi_{|b|} = \sum_{j=|b|+1}^K (j-|b|)a_j$.

Consequently, the BK filter consists of two difference operators and removes linear and quadratic time trends up to two unit roots.

The Christiano-Fitzgerald (CF) filter also uses a mean squared error objective function to approximate the ideal infinite band pass filter. However, whereas the BK filter is a symmetric approximation with no phase shifts, the CF filter is a random walk filter that uses the full time series for the calculation of each of the filtered data points. Consequently, unlike the BK filter, the CF filter does not involve truncation of the beginning and end of the time series being filtered. Thus, the CF filter tends to outperform the BK filter when applied to real-time applications, is applicable to a larger class of time series, converges in the long run to the optimal filter (Nilsson and Gyomai, 2011: 10), and has been found to be more suited to identifying longer-term fluctuations than the BK filter (Everts, 2006).

The CF filter calculates the cyclical component, c_t , as follows:

$$c_t = B_0 y_t + B_1 y_{t+1} + \dots + B_{T-1-t} y_{T-1} + \tilde{B}_{T-t} y_T + B_1 y_{t-1} + \dots + B_{t-2} y_2 + \tilde{B}_{t-1} y_1 \quad (8)$$

where $B_j = \frac{\sin(jb) - \sin(ja)}{\pi j}$ with $j \geq 1$, $B_0 = \frac{b-a}{\pi}$, $a = \frac{2\pi}{p_u}$, $b = \frac{2\pi}{p_l}$, p_u and p_l are the cut-off cycle

lengths and $\tilde{B}_k = -\frac{1}{2}B_0 - \sum_{j=1}^{k-1} B_j$. Thus, cycles longer than p_l and shorter than p_u are preserved in

the cyclical term c_t . Hence, in comparison with the HP filter, the BK and CF band-pass filters have the additional advantage of being able to target a specific frequency band and thus extract from the series all of the components associated with that band, while discarding all the others (Benati, 2001).

Although filtering techniques are widely used in the business cycle literature, they have been the subject of recent criticism. First, it has been found that filters, especially the HP filter, can generate spurious cyclical periodicity when applied to random walk processes (Cogley and Nason, 1995; Harvey and Jaeger, 1993; Osborn, 1995; Benati, 2001; Murray, 2003). Second, band-pass filters typically make the false assumption that the data are generated by a random walk and thus impose inappropriate stationarity and symmetric weights (Benati, 2001). Third, the filtered components can be significantly impacted by outliers and structural breaks (Harding and Pagan, 2002). In a South African context, Boshoff (2010) finds that high-frequency filters are not appropriate measures of the country's business cycles because they tend to be moderately correlated with cumulative supply and demand shocks. In contrast, medium-term band-pass deviation cycles are found to be highly correlated with cumulative shocks and are thus more suitable for studying South Africa's business cycle deviations.

The unobserved components models (UC) as proposed by Watson (1986) and extended by Clark (1989) attempt to overcome these drawbacks by using Kalman filtering techniques to model the unobserved components of the time series in a state-space setting. In a univariate case, the UC model is expressed as follows (Massmann *et al.*, 2003: 95-96):

$$y_t = \mu_t + \gamma_t + \psi_t + v_t + \xi_t \quad (9)$$

where μ_t is the trend component, γ_t is the seasonal component, ψ_t is the cyclical component, v_t is the autoregressive component, and ξ_t is the Gaussian unsystematic component with $\xi_t \sim NID(0, \sigma_\xi^2)$.

Equation (9) is often specified as a local linear trend model with $y_t = \psi_t = 0$, $\mu_t = \mu_{t-1} + \beta_{t-1} + \eta_t$ and $\beta_t = \beta_{t-1} + \zeta_t$ where μ_t is the level of the trend, β_t is the stochastic slope, $\eta_t \sim NID(0, \sigma_\eta^2)$ and $\zeta_t \sim NID(0, \sigma_\zeta^2)$. Thus, by imposing suitable restrictions on the variance parameters of σ_ξ^2 , σ_η^2 and σ_ζ^2 , and given a particular level and trend specification, it is possible to model the cyclical component, ψ_t , and/or the autoregressive component, v_t , and thus capture the cycle that may be

present in the series.¹³ If the variances of σ_η^2 and σ_ζ^2 are both zero, then the trend is deterministic. When only σ_ζ^2 is zero, the slope is fixed, and the trend reduces to a random walk with drift. Allowing σ_ζ^2 to be positive, but setting σ_η^2 to zero, gives an integrated random walk trend, which when estimated by signal extraction, tends to evolve slowly over time.

In addition, the stochastic trend, μ_t , can be combined with the stochastic cycle, ψ_t , to produce a trend-cycle decomposition model (Harvey and Koopman, 2009):

$$y_t = \mu_t + c_t + \zeta_t \quad (10)$$

where the stochastic cycle is given by:

$$\begin{bmatrix} \psi_t \\ \psi_t^* \end{bmatrix} = \varrho \begin{bmatrix} \cos \lambda_c & \sin \lambda_c \\ -\sin \lambda_c & \cos \lambda_c \end{bmatrix} \begin{bmatrix} \psi_{t-1} \\ \psi_{t-1}^* \end{bmatrix} + \begin{bmatrix} K_t \\ K_t^* \end{bmatrix} \quad (11)$$

and λ_c is a parameter in the range of $0 \leq \lambda_c \leq \pi$, ϱ is a damping factor, and K_t and K_t^* are Gaussian white noise disturbances $K_t \sim NID(0, \sigma_K^2)$.

Furthermore, UC models are also able to take account of seasonal patterns by including a seasonal component, γ_t , which is modelled as:

$$\gamma_t = \sum_{j=1}^s \gamma_j \mathfrak{Z}_{jt} \quad (12)$$

where s is the number of seasons and \mathfrak{Z}_{jt} is a dummy variable that takes the value of one in season j and zero otherwise.

Hence the primary difference between UC models and ARIMA filtering approaches is that the UC models explicitly examine the components of the time series, while the ARIMA approaches remove these components and only focus on the cyclical component (Commandeur and Koopman, 2007: 134). Nevertheless, studies that have tested the outcomes of filters and UC approaches have

¹³ See Koopman *et al.* (1999: 140) for specification of the level and trend models.

found that the different techniques produce similar results provided the underlying data generating process is understood.¹⁴

In this study, the empirical analysis is conducted using the full sample Christiano-Fitzgerald (2003) band-pass filter rather than UC models for two reasons: first, due to computational limitations;¹⁵ and second, because the focus of the analysis is on the cross-correlations between the cyclical components rather than on the other components. Nevertheless, prior to filtering the data, the data generating process (DGP) must be examined for any possible misspecification (Wallis, 1974; Nelson and Kang, 1981; Ericsson *et al.*, 1994). Hence in accordance with the approach of Contessi *et al.* (2008), outliers among the capital flows are identified by visual inspection of the data and replaced by the five-year moving average centred on the abnormal quarter.¹⁶ The timing of the applicable outliers relates to the capital flow effects associated with the Anglo American-De Beers unwinding in the second quarter of 2001, as well as the heightened capital flow volatility in 2005 and 2006. The corrected outliers are summarised in Table 3-1:

Table 3-1: Capital Flow Outliers

DIL	PIL	OIL	DIA	PIA	OIA
2001:Q2	2001:Q2	-	2001:Q2	2001:Q2	-
-	-	2005:Q1	-	-	-
2005:Q3	-	-	-	-	-
-	-	-	2006:Q3	-	-
2006:Q4	-	-	-	-	-
-	-	-	-	-	2007:Q4

After correcting for outliers, each series is tested for autocorrelation using Q-statistics with 12 lags. If autocorrelation is detected then the series must first be pre-whitened (Singleton, 1988), which is typically achieved by modelling the series as an ARMA or ARIMA process (Ahumada and Garegnami, 2000). Thereafter, the residuals obtained are retested for autocorrelation, and if found to be non-autocorrelated then the cyclical components of the residuals are extracted using the CF filter (Mills, 2003: 30). Table 3-2 presents the summarised results of the autocorrelation tests.

¹⁴ For example see Massmann *et al.* (2003), Massmann and Mitchell (2002), Mitchell and Mouratidis (2002) and Gerlach and Yiu (2004).

¹⁵ UC analysis is best conducted using *STAMP* and *SyPack* software rather than *Eviews*.

¹⁶ Data points are considered as outliers only if they last for one quarter and demonstrate the greatest positive or negative magnitude in the series. If outliers are too close together to use a five-year window period, the next window period is used instead.

Table 3-2: Autocorrelation Results

Lag	Capital Flows						Business Cycle	Business Cycle Components		
	DIL	PIL	OIL	DIA	PIA	OIA	Log_RGDP	Exports	GFCF	HCE
<i>Cross-Correlation Sample (1995:Q2 - 2007:Q4):</i>										
1	1.884	0.001	0.093	0.391	1.799	0.528	0.542	0.004	0.0205	0.0239
	(0.170)	(0.979)	(0.760)	(0.532)	(0.180)	(0.467)	(0.462)	(0.949)	(0.886)	(0.877)
4	6.672	1.728	5.405	5.474	6.802	3.018	0.660	7.736	1.0281	0.3507
	(0.154)	(0.786)	(0.248)	(0.242)	(0.147)	(0.555)	(0.956)	(0.102)	(0.905)	(0.986)
8	13.958	6.580	9.625	7.905	10.576	4.752	2.912	9.663	2.1613	3.7201
	(0.083)	(0.583)	(0.292)	(0.443)	(0.227)	(0.784)	(0.940)	(0.289)	(0.976)	(0.881)
12	19.477	8.113	10.511	8.211	13.320	12.439	5.656	13.707	3.69	6.9776
	(0.078)	(0.776)	(0.571)	(0.768)	(0.346)	(0.411)	(0.932)	(0.320)	(0.988)	(0.859)
<i>Rolling Correlation Sample (1990:Q2 - 2007:Q4):</i>										
1	0.568	0.060	0.067	0.107	0.227	0.269	0.120	0.064	0.038	0.053
	(0.451)	(0.807)	(0.796)	(0.743)	(0.633)	(0.604)	(0.730)	(0.801)	(0.845)	(0.818)
4	7.341	2.932	6.449	5.656	4.894	1.909	3.211	8.777	1.407	0.794
	(0.119)	(0.569)	(0.168)	(0.226)	(0.298)	(0.752)	(0.523)	(0.067)	(0.843)	(0.939)
8	16.473	10.046	12.625	8.752	9.619	4.571	9.694	13.401	2.990	3.451
	(0.036)	(0.262)	(0.125)	(0.364)	(0.293)	(0.802)	(0.287)	(0.099)	(0.935)	(0.903)
12	18.314	11.090	13.637	9.170	12.893	14.801	19.769	16.402	4.996	5.293
	(0.106)	(0.521)	(0.325)	(0.688)	(0.377)	(0.252)	(0.072)	(0.174)	(0.958)	(0.947)

Probabilities are in parentheses.

It is important to note that the filtered series do not have a direct economic interpretation (Prescott, 1986). Hence this study focusses on the cyclical relationships between the filtered series rather than on the cyclical dynamics of each series individually. In order to determine whether the capital flows lead, lag or are contemporaneous with the business cycle, 4-quarter pair-wise cross-correlation analysis is then conducted on the filtered series.¹⁷

Following Alper (2002), a variable is deemed acyclical if the contemporaneous correlation coefficient and the cross-correlation coefficients are insignificant. If the contemporaneous correlation coefficient is insignificant but there is a significant cross-correlation coefficient at lag s , then the relationship is deemed to be lagging (if s is negative) or leading (if s is positive) depending on the position of the significant coefficient. However, if there is a significant contemporaneous correlation coefficient and a significant lag or lead cross-correlation coefficient, then the relationship is deemed to be lagging or leading depending on the position of the cross-correlation coefficient with the same sign as the contemporaneous coefficient. Following Kaminsky *et al.* (2004) and Contessi *et al.* (2008), the cyclical relationships between the capital flows and business cycle variables are deemed procyclical or counter-cyclical if the significant correlation coefficient is positive or negative respectively; or acyclical if the contemporaneous correlation is insignificant.

However, business cycle phases can alter cyclical relationships and thus the correlations may not be constant over time. Hence in the final part of the analysis, 5-year rolling correlations are used to examine whether the official phases of the South African business cycle (South African Reserve Bank, 2009) matter for the cyclicity of the capital flows.

Table 3-3: Official Turning Points of the South African Economy

Upward Phase			Downward Phase		
Start	End	Quarters	Start	End	Quarters
1993:Q2	1996:Q3	14	1996:Q4	1999:Q2	11
1999:Q3	2007:Q4	34	-	-	-

¹⁷ 4-quarter cross correlations examine the correlations $corr(X_t, Y_{t-s})$ where $s = -4, -3, -2, -1, 0, 1, 2, 3, 4$ and X_t and Y_t represent two generic series.

3.4 DATA DESCRIPTION

Lipsey (1999), Kose *et al.* (2009), and Rothenberg and Warnock (2011) argue that focussing on net capital flows rather than on the disaggregated capital flow components can detrimentally limit the depth of analysis because net capital flows ignore the inter-component dynamics. Hence, this study has included the capital flows on a disaggregated inflow (liability) and outflow (asset) basis. The disaggregated capital flows consist of FDI (*DIL* and *DLA*), portfolio investment (*PIL* and *PLA*), and other investment (*OIL* and *OLA*). All of the capital flow data is measured as a percentage of real seasonally adjusted GDP.

The business cycle is measured by the logarithm of seasonally adjusted real GDP (*Log_RGDP*) in accordance with the business cycle literature. In addition, three business cycle components are also included based on Alper (2002) and consist of real exports (*Exports*), real seasonally adjusted household consumption expenditure (*HCE*), and gross fixed capital formation (*GFCF*). All of the business cycle components are measured as a percentage of real seasonally adjusted GDP.

The data included in this study was obtained from the South African Reserve Bank and is on a quarterly basis. In March 1995, South Africa commenced a process of financial liberalisation, and thereafter, capital inflows and outflows increased substantially as the country reintegrated into the global financial system. Hence two sample periods are used to conduct the analysis: the cross correlation analysis uses a sample that runs from the second quarter of 1995 to the end of 2007, while the 5-year rolling correlations make use of a sample that commences in the second quarter of 1990 so as to have an effective start-date of 1995.¹⁸

3.5 EMPIRICAL RESULTS

3.5.1 Cross-Correlation Results

The results of the cross-correlation analysis between the capital flow components and the business cycle variables are presented in Table 3-4. Regarding the capital inflows, portfolio and other investment inflows are both found to be acyclical, which suggests that South Africa's post-liberalisation 'hot' inflows have not been significantly associated with domestic business cycle fluctuations.

¹⁸ The Christiano-Fitzgerald filtered data is graphically presented in Appendix 3-A.

In contrast, FDI inflows are found to have a significantly counter-cyclical association with the business cycle, which accords with the empirical literature. A variety of reasons have been advocated to explain the prevalence of counter-cyclical FDI inflows among emerging countries. Goldberg and Klein (1998) argue that a depreciation of the real exchange rate in the recipient country will reduce domestic labour and other input costs and thus raise the return on investment. Smith and Valderrama (2009) suggest that since FDI inflows are associated with the change in price from domestic to foreign ownership, counter-cyclical FDI inflows could arise from the difference between the foreign and domestic valuation of the recipient country firm. They argue that the two factors that give rise to this cyclical relationship are capital accumulation and external financing costs, which are impacted by business cycle fluctuations. Thus, as a firm accumulates capital, its value increases and consequently the sale price rises accordingly. However, if the capital accumulation is accomplished using external debt, then when the business cycle turns and debt costs increase, borrowing will decline and consequently so will capital accumulation. However, the purchase price will still occur at the higher price, thus producing a counter-cyclical effect. Kaminsky *et al.* (2004) argue that since fiscal and monetary policies in emerging countries tend to be procyclical, access to finance will be procyclical as well, while the cost of external financing will be counter-cyclical. Hence, the relationship between FDI inflows and the domestic business cycle fluctuations will be counter-cyclical because of the tightening of monetary policy following a contractionary phase. Contessi *et al.* (2008) note that financial constraints can impact the value of the firm and thus during a contractionary phase, financial constraints may make the target firm more willing to sell.

With regards to the cyclical relationships between the capital outflows and the business cycle fluctuations, the results show that the outflows tend to be procyclical and leading. This result accords with Broner *et al.* (2011), who argue that during expansionary phases domestic business cycle fluctuations tend to heighten capital flight and repatriation because foreign agents invest abroad in search of heightened returns, while domestic agents invest abroad to diversify their portfolios. In a South African context, Fedderke and Liu (2002) find that the capital flows are sensitive to fluctuations in political risk and instability. Mohamed and Finnoff (2004) further report that over the years of 1994 to 2000 capital flight from South Africa averaged 9.2% of GDP and can be attributed to heightened risk-aversion associated with the country's new dispensation. Furthermore, this finding suggests that the regulatory control of capital outflows as implemented in Malaysia could limit the magnitude of capital flight and repatriation. However, although the capital controls have been found to decrease the volatility of short-term flows (Kaplan and Rodrik, 2001), they have also been found to decrease the volume of flows (Ariyoshi *et al.*, 2000; Inoguchi, 2009),

increase stock market volatility (Ali and Espinoza, 2006), and decrease FDI investment due to heightened uncertainty with regards to the ease of repatriating profits (Feldstein, 1999).

Thus in summary, the cross-correlations find that FDI inflows are counter-cyclical and proactive, the 'hot' inflows are acyclical, and the capital outflows are procyclical and proactive. Hence, the results show that the capital outflows are more significantly associated with domestic business cycle fluctuations than the capital inflows.

In order to gain a more detailed understanding of the cyclical relationships between the capital flows and domestic business cycle fluctuations, the analysis turns to the cyclical associations with the business cycle components of exports, fixed investment and household consumption. Commencing with exports, the results show that in accordance with prior expectations, the relationships are procyclical for the inflows and counter-cyclical for the outflows. South Africa's post-liberalisation exports have increasingly diversified away from primary commodities towards manufactured goods (Edwards and Lawrence, 2008) and thus the procyclical (counter-cyclical) relationship between the inflows (outflows) and exports suggests that South Africa's capital flow dynamics are significantly associated with domestic and international demand for manufactured goods. In addition, it is found that FDI flows lead exports, while the 'hot' flows lag exports. This result possibly reflects the differing character and risk-appetites of the capital flow components, whereby FDI is more directly associated with the production of export goods, whereas the 'hot' flows respond to the returns associated with heightened economic activity. Furthermore, FDI investment is typically of a longer duration and is more capital intensive than portfolio or other investment and thus tends to be more risk-averse than the 'hot' flows (Lim, 2001; Christie, 2003; Alfaro, 2003). Hence, FDI tends to be proactive, while the 'hot' flows tend to be reactive.

With regards to the cyclical relationships between the capital inflows and fixed investment, FDI and other investment have a procyclical relationship, while portfolio investment is significantly counter-cyclical. In addition, the lead/lag results show that FDI inflows lag fixed investment but the 'hot' flows lead fixed investment (FDI outflows are contemporaneous). South Africa's post-liberalisation growth in real fixed investment has been relatively level, while the financial sector has grown disproportionately large (Fedderke, 2010). Consequently, the cross-correlation results suggest that the country's moderate level of fixed investment may have stimulated portfolio investment to a greater extent than attracting FDI. Furthermore, the finding that FDI and portfolio investment outflows are both procyclically associated with fixed investment, indicates that there is no substitution between the capital flows, since if substitution was occurring, the sources of finance would move in opposite directions such that as FDI pulls out, portfolio investment takes over (and

vice-versa). Hence, the results suggest that the opposite cyclical associations of FDI and portfolio inflows with fixed investment reflect differing investment strategies rather than substitution effects.

The cross-correlation results further show that portfolio inflows (outflows) have a significantly procyclical (counter-cyclical) and leading association with household consumption expenditure, while FDI and other outflows are counter-cyclical and contemporaneous. This result accords with prior expectations because in common with many other emerging countries, South Africa has commonly recycled the portfolio inflows as credit extension, which in turn has been used for household consumption expenditure (Mohamed, 2003).

Thus in summary, the cross-correlations show that the cyclical relationships between the inflows and the business cycle components are generally procyclical, with the notable exception of portfolio inflows and fixed investment, which are counter-cyclical. In contrast, the capital outflows are counter-cyclically associated with exports and household consumption, and procyclically associated with fixed investment.

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Table 3-4: Cross-Correlation Results

Capital Flows	Lag				0	Lead			
	-4	-3	-2	-1		1	2	3	4
<i>Cross Correlation with Log_RGDP:</i>									
DIL	-0.397	-0.257	0.021	0.233	0.216	-0.024	-0.308	-0.404	-0.206
PIL	0.135	0.096	0.055	0.060	0.096	0.111	0.033	-0.113	-0.239
OIL	-0.196	0.076	0.256	0.232	0.075	-0.042	-0.049	0.008	0.030
DIA	-0.279	-0.307	-0.279	-0.214	-0.093	0.117	0.360	0.539	0.523
PIA	-0.047	-0.242	-0.349	-0.299	-0.116	0.095	0.288	0.405	0.413
OIA	0.134	-0.117	-0.323	-0.361	-0.180	0.147	0.452	0.523	0.269
<i>Cross Correlation with Exports:</i>									
DIL	0.258	0.267	0.151	0.030	0.018	0.133	0.297	0.384	0.329
PIL	0.296	0.442	0.527	0.468	0.250	-0.031	-0.249	-0.300	-0.174
OIL	0.441	0.269	0.019	-0.139	-0.112	0.064	0.264	0.356	0.289
DIA	-0.015	-0.031	-0.014	0.014	-0.007	-0.107	-0.277	-0.421	-0.426
PIA	-0.407	-0.336	-0.206	-0.081	-0.006	0.006	-0.021	-0.049	-0.054
OIA	-0.362	-0.170	0.063	0.198	0.160	-0.027	-0.237	-0.333	-0.245
<i>Cross Correlation with GFCF:</i>									
DIL	0.142	0.290	0.320	0.246	0.129	0.034	-0.011	-0.004	0.034
PIL	0.193	0.499	0.568	0.309	-0.166	-0.596	-0.718	-0.469	-0.020
OIL	0.248	-0.163	-0.393	-0.266	0.113	0.432	0.434	0.120	-0.263
DIA	-0.068	0.031	0.181	0.322	0.362	0.231	-0.050	-0.380	-0.592
PIA	-0.074	-0.125	-0.125	-0.049	0.108	0.316	0.473	0.455	0.215
OIA	-0.092	-0.087	-0.062	-0.006	0.067	0.113	0.080	-0.041	-0.187
<i>Cross Correlation with HCE:</i>									
DIL	-0.267	-0.172	-0.055	0.021	0.037	0.016	-0.015	-0.039	-0.052
PIL	-0.328	-0.245	-0.046	0.165	0.302	0.340	0.304	0.229	0.146
OIL	-0.062	-0.201	-0.236	-0.125	0.056	0.185	0.193	0.099	-0.012
DIA	0.653	0.398	-0.002	-0.334	-0.455	-0.370	-0.196	-0.067	-0.020
PIA	0.310	0.311	0.121	-0.147	-0.338	-0.363	-0.251	-0.097	-0.002
OIA	0.518	0.188	-0.232	-0.533	-0.583	-0.387	-0.061	0.248	0.420

Significant contemporaneous correlation coefficient > 0.3 (5% significance level). The most significant correlations in excess of 2-standard error bounds are indicated in bold.

3.5.2 Rolling Correlation Results

Figure 3-1 graphically presents the results of the 5-year rolling correlations and Table 3-5 summarises the proportion of time that the capital flows demonstrate a procyclical association in a particular business cycle phase. Considered in combination with the logarithm of GDP, the results show that FDI and other investment inflows tend to be more procyclical during down-phases, while

portfolio inflows are procyclical over both the up- and down-phases post-1996. In contrast, FDI outflows and portfolio outflows tend to be more procyclical during up-phases, while other investment outflows tend to be more procyclical during down-phases. Hence, these results support the cross-correlation results, which showed that the portfolio inflows are not significantly impacted by domestic business cycle fluctuations, and that expansionary phases are associated with capital flight and repatriation.

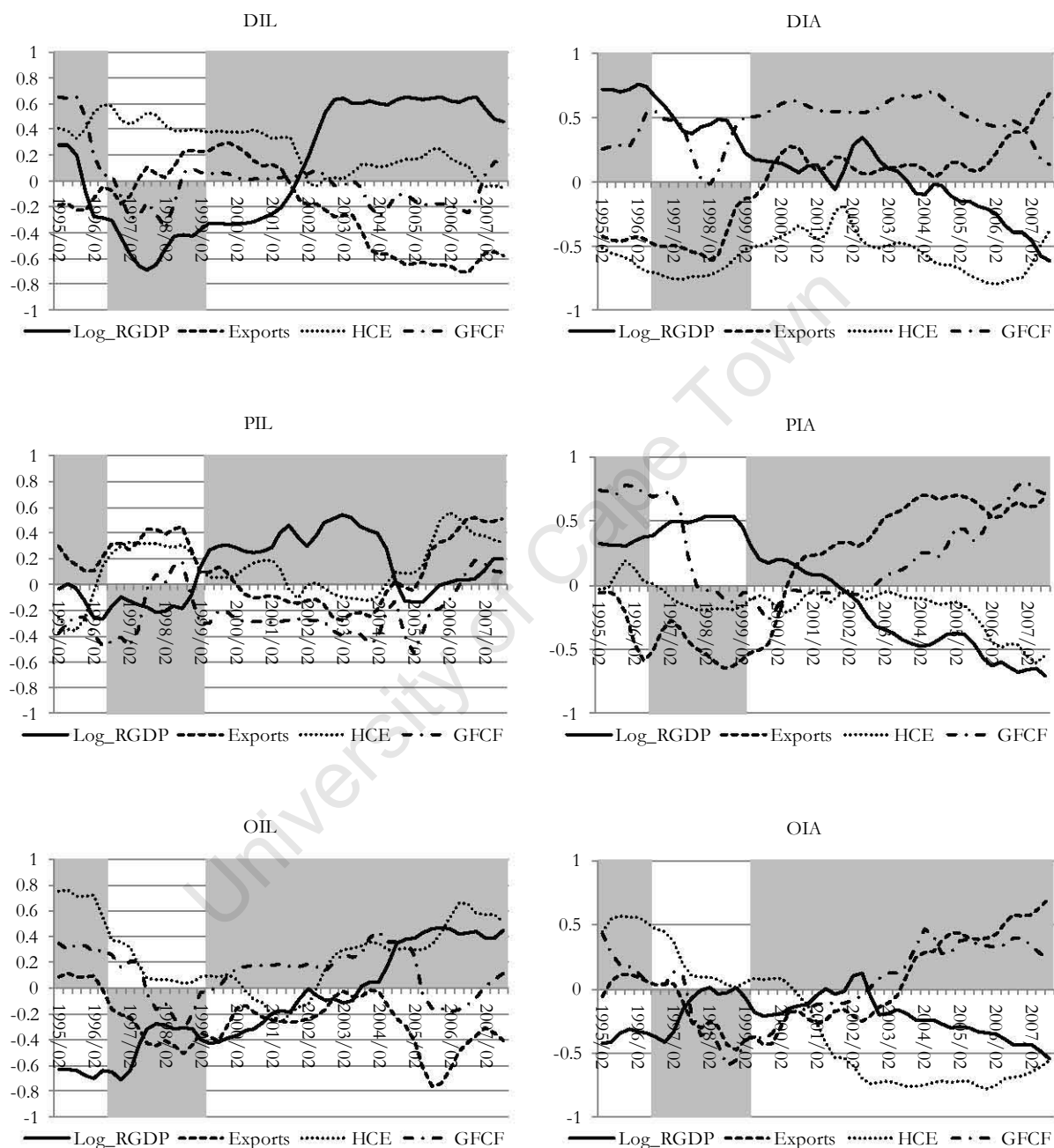
With regards to the business cycle components, the rolling correlations show that the business cycle phases matter most significantly for the relationships between the capital flows and household consumption. However, although all of the capital inflows are found to be more procyclically associated with household consumption during expansionary phases, FDI and portfolio outflows tend to be more procyclical during down-phases, while other outflows are procyclical during up-phases. Hence in accordance with prior expectations, these results indicate that expansionary phases stimulate capital inflow-driven household consumption expenditure, which then declines during contractionary phases.

Regarding the relationship with exports, portfolio inflows are more procyclical during up-phases, while the remaining inflows and outflows are inconclusive. Considered in combination with the cross-correlation results, this finding suggests that the business cycle phases impact the relationship between portfolio investment and exports more than the other capital flow components. Finally, the cyclical relationships between the capital flows and fixed investment were significantly procyclical during the up-phase of 1995-1996 for all of the capital flows except for portfolio inflows. Thereafter, the cyclical relationships weakened over the subsequent down- and up-phases with the exception of FDI outflows, which are procyclical during up-phases. This result accords with prior expectations, because the country's static level of fixed investment implies that the business cycle phases should not significantly impact the cyclical relationships with the capital flows.

Thus, the results of the 5-year rolling correlations show that FDI and other investment inflows are most significantly procyclical during down-phases, while FDI and portfolio investment outflows are most significantly procyclical during up-phases. In contrast, the business cycle phases do not significantly impact portfolio inflows and other investment outflows. On a business cycle component basis, the results are more varied. With regards to the inflows, all of the capital flows tend to be procyclical during up-phases for household consumption and only portfolio inflows are more procyclical during up-phases for exports. None of the capital inflows demonstrate clear patterns in association with fixed investment. With regards to the outflows, only FDI outflows are procyclical during down-phases for household consumption and during up-phases for fixed investment, and only other outflows are procyclical during up-phases for household consumption.

In contrast, portfolio outflows are not consistently procyclical during up- or down-phases in association with any of the business cycle components.

Figure 3-1: Business Cycle Rolling Correlations¹⁹



¹⁹ Official up and down phases of the South African business cycle are shaded in gray.

Table 3-5: Percentage of Time within Business Cycle Phase Correlations

Period	Phase	Capital Inflows				Capital Outflows			
		Business Cycle	Business Cycle Components			Business Cycle	Business Cycle Components		
		Log_RGDP	Exports	HCE	GFCF	Log_RGDP	Exports	HCE	GFCF
FDI Inflows (DIL):						FDI Outflows (DIA):			
1995:Q2-1996:Q3	Up	50%	0%	100%	100%	100%	0%	0%	100%
1996:Q4-1999:Q2	Down	100%	27%	0%	64%	0%	100%	100%	9%
1999:Q3-2007:Q4	Up	71%	26%	85%	53%	50%	94%	0%	100%
Portfolio Inflows (PIL):						Portfolio Outflows (PLA):			
1995:Q2-1996:Q3	Up	17%	100%	17%	0%	100%	0%	67%	100%
1996:Q4-1999:Q2	Down	91%	0%	0%	64%	0%	100%	91%	55%
1999:Q3-2007:Q4	Up	85%	44%	71%	15%	29%	85%	0%	59%
Other Inflows (OIL):						Other Outflows (OLA):			
1995:Q2-1996:Q3	Up	0%	83%	100%	100%	0%	83%	100%	100%
1996:Q4-1999:Q2	Down	100%	100%	0%	64%	82%	73%	0%	64%
1999:Q3-2007:Q4	Up	50%	0%	74%	76%	6%	50%	15%	62%

Percentages indicate the number of quarters that the capital flows are positive during up phases and negative during down phases (the higher the percentage the more procyclical).

3.6 CONCLUSION

This study used Christiano-Fitzgerald (2003) filtered correlation analysis to investigate the cyclical relationships between South Africa's post-liberalised capital flows and domestic business cycle fluctuations. The cross-correlation results show that FDI inflows are counter-cyclical and proactive, while the 'hot' inflows are acyclical. Thus, South Africa's post-liberalisation 'hot' inflows have not been significantly associated with domestic business cycle fluctuations. In contrast, the capital outflows are found to be consistently procyclical and proactive, suggesting that the outflows are more significantly associated with domestic business cycle fluctuations than the capital inflows. 5-year rolling correlations further show that FDI and other investment inflows are most significantly procyclical during down-phases, while FDI and portfolio investment outflows are most significantly procyclical during up-phases. In contrast, the business cycle phases do not significantly impact portfolio inflows and other investment outflows.

In addition, the cross-correlation analysis finds that the cyclical relationships between the inflows and the business cycle components of exports, household consumption and gross fixed investment are generally procyclical, except for portfolio inflows, which have a counter-cyclical relationship with fixed investment. In contrast, the capital outflows are counter-cyclically associated with exports and household consumption, and procyclically associated with fixed investment. Furthermore, it is found that FDI flows lead exports, while the 'hot' flows lag exports; however, the opposite is the case with fixed investment. In the case of household consumption, only portfolio flows have a leading association with consumption, while the remaining capital flow components are either acyclical or contemporaneous.

The results of the 5-year rolling correlations show that the impacts of the business cycle phases have varied effects on the cyclical relationships. Although the capital flows tend to be procyclical during up-phases for household consumption, only portfolio inflows are more procyclical during up-phases for exports, and none of the capital inflows demonstrate clear patterns in association with fixed investment. With regards to the outflows, only FDI outflows are more procyclical during down-phases for household consumption and during up-phases for fixed investment, and only other outflows are more procyclical during up-phases for household consumption. In contrast, portfolio outflows are not consistently procyclical during up- or down-phases in association with any of the business cycle components.

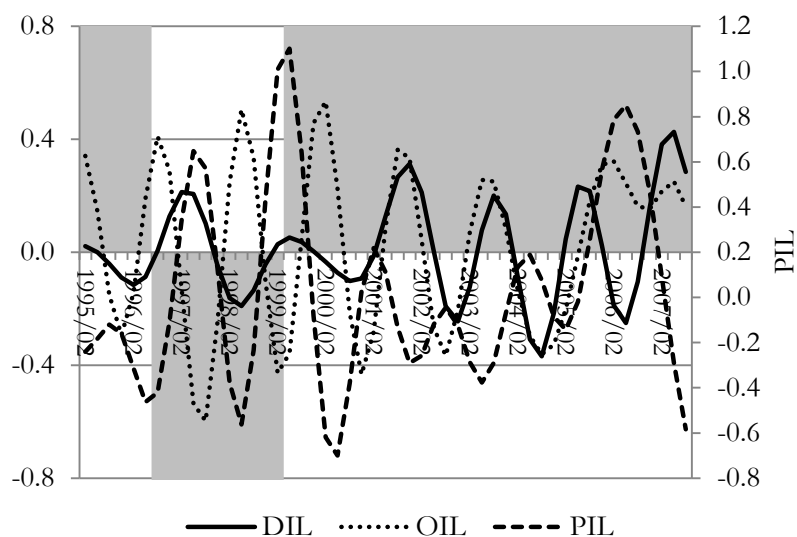
These results further suggest that policy choices need to accomplish two goals: first, to stabilise the domestic business cycle so as to limit the degree of capital flight and repatriation during expansionary phases; and second, to smooth the capital inflow-driven private consumption patterns.

The three policy mechanisms available to achieve these tasks consist of counter-cyclical monetary policy, counter-cyclical fiscal policy, and nominal exchange rate flexibility (Lopez-Mejia, 1999). However, the effectiveness of these policies can be impacted by structural factors, as well as by the cyclicity of the policy responses to the capital flows themselves. Hence, the next chapter of the empirical investigation is to examine the cyclical relationships between South Africa's capital inflows and domestic fiscal and monetary policies.

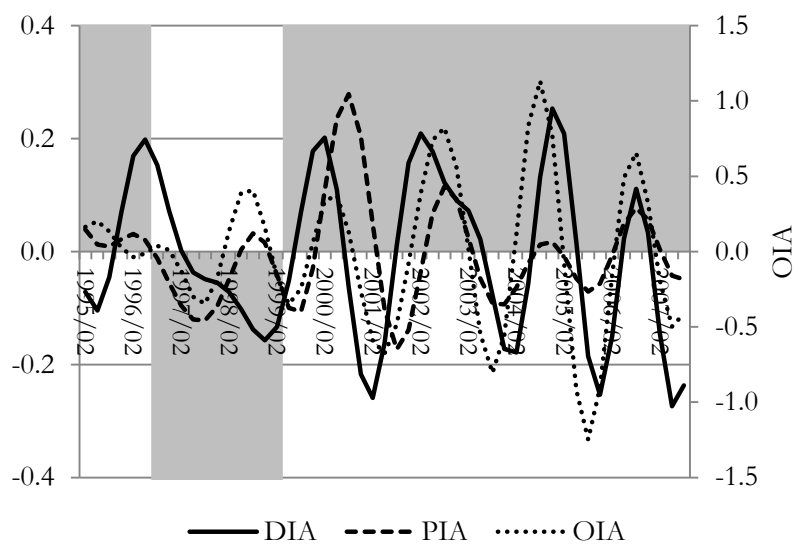
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APPENDICES

Appendix 3-A: Christiano-Fitzgerald Filtered Capital Flow Liabilities²⁰

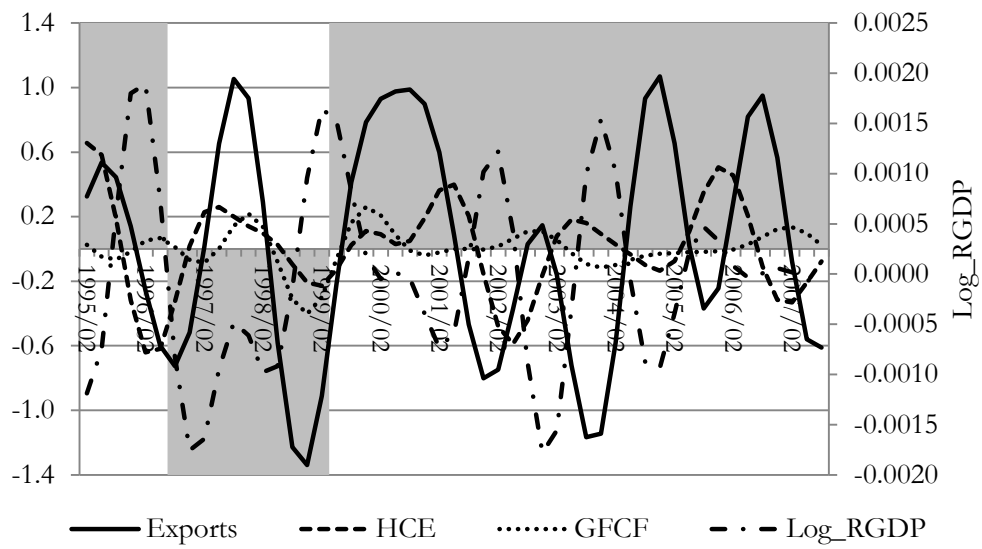


Appendix 3-B: Christiano-Fitzgerald Filtered Capital Flow Assets



²⁰ Gray shading represents official up and down phases of the South African business cycle.

Appendix 3-C: Christiano-Fitzgerald Filtered Business Cycle Variables



CHAPTER 4

THE CYCLICAL RELATIONSHIPS BETWEEN SOUTH AFRICA'S CAPITAL INFLOWS AND FISCAL AND MONETARY POLICIES

4.1 INTRODUCTION

International capital flows have benefited emerging countries by facilitating the accumulation of foreign assets in good times and the depletion of those assets or increased borrowing during bad times, thus mitigating the deterioration of living standards that arise from shocks to domestic income and production (Bernanke, 2005). In exchange, international investors have been able to benefit from portfolio growth and risk mitigation via international diversification (Contessi *et al.*, 2008). However, capital inflows can have detrimental side-effects such as inflationary pressure, real exchange rate appreciation, widening current account deficits, and heightened financial instability. Consequently, maintaining a balance between monetary and fiscal policy is crucial for attracting capital inflows while managing possible macroeconomic repercussions.

According to the traditional Keynesian and Neo-Classical theories, policies should be counter-cyclical or acyclical respectively (Demirel, 2010). To achieve this, policy makers have traditionally proposed the use of counter-cyclical policies, which consist of: tight monetary and fiscal policies coupled with flexible exchange rates; structural policies, which consist of trade liberalisation and regulatory banking supervision; and regulatory controls on capital inflows or capital outflows (Lopez-Mejia, 1999).

However, the adoption of these various policy options by emerging countries has proven problematic. Emerging countries are often unable to build up the budget surpluses and reserves needed to implement counter-cyclical policies, and as a result, are unable neither to defend their currencies from the large exchange rate effects nor to mitigate the accompanying macroeconomic instability that accompanies large capital inflows (Eichengreen, 2000). In addition, in many emerging countries monetary policy is often a substitute for fiscal discipline, which thus constrains monetary policy, as the central bank must take cognisance of government's debt management objectives while attempting to maintain price stability (Sims, 2005).

With regard to structural policies, many emerging countries do not have robust or independent central banks that are able to withstand political pressure, and do not have the institutional sophistication needed to model a rapidly changing macroeconomic environment (Nijathaworn and Disyatat, 2009). Furthermore, modelling the trade impacts of capital inflows is difficult and thus emerging countries are not able to counter the disruption to inflation targeting arising from changes in openness easily (Aron and Muellbauer, 2009). Although capital controls have been imposed in several countries in recent years, such controls are difficult to operate in an information-driven, globalised economy (Eichengreen, 2004: 10). Furthermore, the high interest rate differentials that typically accompany sterilisation policies can produce an incentive to circumvent capital controls (Reinhart and Reinhart, 1998). As a result of many of these short-comings, the cyclical relationships between capital flows and macroeconomic policy in many emerging countries is often procyclical rather than counter-cyclical.

Although studies of the cyclicity of South Africa's fiscal and monetary policies are relatively extensive, no study to date has explicitly examined the cyclical relationship between the country's disaggregated capital inflows and fiscal and monetary policies.²¹ Hence, this study uses Christiano-Fitzgerald (2003) filtered correlation analysis and Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL) causality tests to answer four questions: (i) are the cyclical relationships between South Africa's capital flows and fiscal and monetary policies procyclical, counter-cyclical, or acyclical; (ii) are the relationships contemporaneous or do the capital inflows lag or lead the policy factors; (iii) do the phases of the business cycle matter for the cyclical relationships; and (iv), does fiscal and monetary policy react to the capital flows or do the capital flows react to the policy factors? The remainder of this chapter proceeds as follows: Section 4.2 examines the relevant literature; Section 4.3 explains the various methodologies employed; Section 4.4 briefly describes the data utilised; in Section 4.5 the results of the empirical analysis are presented and briefly discussed; and the chapter concludes with a summary of the findings in Section 4.6.

4.2 LITERATURE REVIEW

Conventional Keynesian models posit that the cyclical relationships between fiscal and monetary policies and the business cycle should be counter-cyclical. Hence, it is argued that counter-cyclical

²¹ South Africa has been included as a middle-income country in panel data studies such as Talvi and Vegh (2000), Kaminsky *et al.* (2004), Alesina and Tabellini (2005), Lee and Sung (2007), Yakhin (2008), and Cardarelli *et al.* (2010).

fiscal policy can be achieved by lowering government spending and raising tax rates in expansionary phases and increasing government spending and lowering tax rates in contractionary phases (Talvi and Vegh, 2000).²² Similarly, counter-cyclical monetary policy can be achieved under flexible exchange rates by cutting interest rates and increasing government expenditure during contractionary phases (Demirel, 2010).

Empirical studies by Gali (1994), Gavin and Perotti (1997), Stein *et al.* (1999) and Akitoby *et al.* (2006), report that fiscal policy in developed countries is predominantly counter-cyclical. Alesina and Perotti (1997), Giavazzi and Pagano (1990 and 1996), Hallet *et al.* (2002), Lee and Sung (2007), Fiorito (1997), Sorensen *et al.* (2001), and Lane (2003a) further find that the cyclical relationships are counter-cyclical in OECD countries, while Blanchard and Perotti (2003), Edelberg *et al.* (1999), and Burnside *et al.* (2004) find that the cyclical relationships are counter-cyclical in the U.S. at a national level, and Bayoumi and Eichengreen (1995), and Sorensen *et al.* (2001) find similar results at a state level.

In contrast, Talvi and Vegh (2000), Catao and Sutton (2002), Akitoby *et al.* (2006) and Ilzetzki and Vegh (2008) find that fiscal policy in emerging countries is typically procyclical.²³ Gavin and Perotti (1997) and Gavin *et al.* (1996) find that fiscal policy is procyclical in Latin America, and Khan (2011) reports that fiscal policy is procyclical in East Asian countries. Three primary reasons have been proposed for the predominance of procyclicality. First, Gavin and Perotti (1997), Aizenman *et al.* (2000), Ocampo (2002), Riascos and Vegh (2003), Kaminsky *et al.* (2004), da Costa e Silva and Compton (2008) argue that the procyclical policy is an outcome of emerging country's limited access to international capital during contractionary phases and renewed access to international finance during expansionary phases. Second, Lane and Tornell (1996 and 1999), Talvi and Vegh (2000), Alesina and Tabellini (2005), and Diallo (2009) argue that procyclical policy arises from political distortions associated with voter incentives, government misconduct and weak institutions, which favour expanded fiscal expenditure during booms and contractionary fiscal policy during downturns. Third, many emerging countries are resource-rich and thus tend to suffer from Dutch Disease, whereby governments increase spending via heightened tax revenues and borrowings during commodity booms but then find it difficult to reduce expenditure when commodity prices decline (Frankel *et al.*, 2007).

²² An alternative approach is the tax-smoothing hypothesis of Barro (1979), which posits that tax rates and government spending should be held constant over the business cycle but the budget surplus should be procyclical. Overall, this will produce a counter-cyclical fiscal policy whereby a fiscal deficit is run during a contractionary phase and a surplus is run during an expansionary phase.

²³ An exception is Agénor *et al.* (1999) who report that the fiscal impulse (defined as the ratio of government spending to government revenue) in Korea, Mexico, and the Philippines is counter-cyclical.

The prevalence of procyclical fiscal policy also has implications for monetary policy. The primary aim of monetary policy is price stability (Bernanke *et al.*, 1999). However, according to the post-Keynesian paradigm, disinflationary monetary policy is not possible in circumstances where a government runs a large spending deficit (Dragutinovic, 2009: 222). On the other hand, the monetarist view argues that although fiscal policy has an impact on inflation; ultimately, inflation can be controlled by counter-cyclical monetary policy, whereby the short-term interest rate is raised during expansionary phases and reduced during contractionary phases.

On an empirical level, Lane (2003b) finds that monetary policy in developed countries is predominantly counter-cyclical. However, Yakhin (2008), Christiano *et al.* (2004), and Chang and Valesco (2001) report that monetary policy in emerging countries is commonly procyclical, while Khan (2011) finds that monetary policy in low-income Asian countries is acyclical (or slightly procyclical) but tends to be counter-cyclical in higher-income Asian countries. The two explanations for the prevalence of procyclical monetary policy relates to the joint role of exchange rates and inflation targeting. First, Calvo and Reinhart (2000) argue that many countries use a managed floating exchange rate regime. Hence, monetary policy is shaped by capital movements, whereby heightened capital inflows will lead to exchange rate appreciation and thus interest rates must be lowered, whereas when the capital flows out, interest rates must be raised. Second, under an inflation targeting regime, capital inflows will ease inflationary pressure on prices and thus lead to a decline in interest rates, while capital outflows will cause inflationary pressure and thus interest rates will rise. Consequently, monetary policy is loosened during capital inflows and tightened during outflows, producing a procyclical effect.

Although there is a substantial body of literature on the cyclical relationships between fiscal and monetary policy and the business cycle, there are relatively few studies devoted to the cyclical relationships with capital flows. Nevertheless, the results of most empirical analysis report a predominance of procyclical associations between the capital flows and policies. Among the most comprehensive study is Kaminsky *et al.*, (2004), who investigate the cyclical relationships between fiscal and monetary policies and net capital flows of 104 countries over the period of 1960 to 2003. The results show that for emerging countries, capital inflows are procyclically associated with expansionary policies, while capital outflows are associated with contractionary policies. Fernandez-Arias and Panizza (2001) find that over the period of 1975 to 1997, the cyclical relationships in Latin America were procyclical. In addition, further analysis using two sample periods (1975 to 1981 and 1990 to 1997) shows that a significant contributing factor was the limited access to finance. Da Costa e Silva and Compton (2008) examine the cyclical relationships in four Latin American countries comprising Argentina, Brazil, Chile, and Mexico over the period of 1970 to 2000. The

results show that capital inflows exert a significant procyclical influence on the fiscal and monetary policies of Argentina, Brazil, and Mexico but not Chile. Khan (2011) investigates the cyclical behaviour of policies and capital flows in 28 Asian countries over the period of 1950 to 2009. The results show that the cyclical relationship between capital flows and fiscal policy in low income Asian countries is procyclical, but is acyclical (or slightly counter-cyclical) in higher-income Asian countries.

In contrast, Calderon and Schmidt-Hebbel (2003) find that the cyclical relationships between capital flows and fiscal and monetary policies of 11 Latin American and Caribbean countries over the period of 1996 to 2002 vary depending on the level of country spreads. When country spreads are low or moderate, the cyclical relationships are significantly counter-cyclical, while higher country spreads bias both fiscal and monetary policies towards being pro-cyclical. Calderon and Schmidt-Hebbel posit that the reason for this dynamic is that countries with better fundamentals and larger credibility will have low to moderate risk spreads and will thus be able to pursue counter-cyclical policies. On a theoretical level, Demirel (2010) shows that foreign interest rate dynamics can influence the cyclicity of optimal macroeconomic policies. When there is a significant country spread, the optimal relationship between fiscal and monetary policies and capital flows is procyclical. However, when there is no country spread, then the cyclical associations turn counter-cyclical. Thus in a globalised world, the cyclical relationships between capital movements and domestic policies are impacted by capital market imperfections.

Historically, South Africa has made use of a wide variety of fiscal and monetary policies,²⁴ which could be one of the reasons why studies of the cyclical relationships between domestic policies and the business cycle have yielded inconsistent results. With regard to domestic fiscal policy, Swanepoel and Schoeman (2003), Horton (2005), Ajam and Aron (2007), Swanepoel (2007), Calitz and Siebrits (2003), Burger and Jimmy (2006), and Frankel *et al.* (2007) report a predominance of procyclicality after the country's political liberalisation in 1994. However over the long-term, it has been reported that fiscal policy has periodically swung between being procyclical and counter-cyclical. Swanepoel (2004) finds that fiscal policy was procyclical from 1973 to 1982, and then turned counter-cyclical from 1983 to 1993 before becoming procyclical from 1994 to 2003. Alesina and Tabellini (2005) find counter-cyclical fiscal policy from 1972 to 1998 and du Plessis and Boshoff (2007) report that fiscal policy was counter-cyclical from 1992 to 2006. In contrast, Akitoby *et al.* (2006) find that fiscal policy was acyclical from 1970 to 2002, du Plessis *et al.* (2007) reports that fiscal policy was

²⁴ For a description of South Africa's historical fiscal policy choices see Calitz and Siebrits (2003), du Plessis and Boshoff (2007), and Ajam and Aron (2007), while for monetary policy see Ncube and Leape (2008) and Aron and Muellbauer (2009).

ambiguous from 1994 to 2002 and strongly procyclical from 2002 to 2006, and Canales-Kriljenko (2011) finds that fiscal policy was counter-cyclical from 2003 to 2010.

With regard to monetary policy, studies by du Plessis and Smit (2003), du Plessis (2005), Swanepoel and Schoeman (2003), and Swanepoel (2004) report a predominance of procyclicality post-1994. However, du Plessis *et al.* (2007) report that monetary policy was weakly counter-cyclical from 1994 to 2004 and procyclical from 2004 to 2006, Thornton (2007) finds that monetary policy was counter-cyclical from 1972 to 2001, while Canales-Kriljenko (2011) finds that monetary policy was counter-cyclical from 2003 to 2010. Hence, the cyclical dynamics of South Africa's policy mechanisms remains an unresolved area of on-going research.

4.3 METHODOLOGY

This study uses the Christiano-Fitzgerald (2003) (CF) filter and empirical approach as previously described in section 3.3. In the first step, outliers among the capital flows are corrected using the approach of Contessi *et al.* (2008) whereby the outliers are identified by visual inspection of the data and then replaced by the five-year moving average centred on the abnormal quarter.²⁵ The timing of the applicable outliers relates to the effects associated with the Anglo American-De Beers unwinding in the second quarter of 2001, as well as the heightened volatility of FDI in the third quarter of 2005 and the fourth quarter of 2006, and other investment in the first quarter of 2005.

Thereafter, each series is tested for autocorrelation using standard Q-statistics, and where autocorrelation is identified; the affected series are modelled using autoregressive models. The residuals obtained are then retested for autocorrelation and if the affected series are found to be non-autocorrelated then the cyclical components are extracted using the CF filtering technique. The results of the autocorrelation tests are presented in Table 4-1.

²⁵ Data points are considered as outliers only if they last for one quarter and demonstrate the greatest positive or negative magnitude among the series. If outliers are too close together to use a five-year window period, the next window period is used instead.

Table 4-1: Autocorrelation Test Results

Lag	Net Capital Flows			Fiscal Policy			Monetary Policy		
	NDI	NPI	NOI	Gov_Exp	Tax_Rev	I_Tax	Credit	M1	Tbill
<i>Cross-Correlation Sample (1994:Q2 - 2007:Q4):</i>									
1	0.076 (0.783)	0.014 (0.907)	0.360 (0.548)	0.011 (0.917)	0.177 (0.674)	0.034 (0.853)	0.711 (0.399)	0.019 (0.889)	3.132 (0.077)
4	3.358 (0.500)	2.147 (0.709)	1.894 (0.755)	2.148 (0.708)	3.096 (0.542)	6.717 (0.152)	3.057 (0.548)	1.108 (0.893)	4.062 (0.398)
8	6.260 (0.618)	9.325 (0.316)	5.372 (0.717)	3.861 (0.869)	10.430 (0.236)	8.502 (0.386)	8.210 (0.413)	3.921 (0.864)	6.813 (0.557)
12	8.166 (0.772)	11.195 (0.512)	6.816 (0.870)	7.061 (0.854)	14.469 (0.272)	9.549 (0.655)	17.609 (0.128)	4.947 (0.960)	10.776 (0.548)
<i>Rolling Correlation Sample (1989:Q2 - 2007:Q4):</i>									
1	0.096 (0.757)	0.062 (0.804)	0.488 (0.485)	0.179 (0.672)	0.914 (0.339)	0.088 (0.766)	4.046 (0.044)	0.107 (0.744)	0.000 (0.990)
4	4.502 (0.342)	3.153 (0.533)	2.492 (0.646)	1.011 (0.908)	4.947 (0.293)	9.033 (0.060)	5.026 (0.285)	1.915 (0.751)	0.318 (0.989)
8	8.275 (0.407)	12.998 (0.112)	6.808 (0.557)	5.900 (0.658)	10.040 (0.262)	11.552 (0.172)	12.141 (0.145)	6.323 (0.611)	2.719 (0.951)
12	10.724 (0.553)	15.155 (0.233)	8.630 (0.734)	10.295 (0.590)	14.615 (0.263)	12.841 (0.381)	16.487 (0.170)	7.960 (0.788)	6.706 (0.876)

Probabilities are in parentheses.

After filtering the data, the cyclical relationships between the net capital inflows and fiscal and monetary policy variables are examined using pair-wise cross-correlation analysis with 4-quarter leads and lags.²⁶ Following Alper (2002), a variable is deemed acyclical if the contemporaneous correlation coefficient and the cross-correlation coefficients are insignificant. However, if the contemporaneous correlation coefficient is insignificant but there is a significant cross-correlation coefficient at lag s , then the relationship is deemed to be lagging (if s is negative) or leading (if s is positive) depending on the position of the significant coefficient. In addition, if there is a significant contemporaneous correlation coefficient and a significant lag or lead cross-correlation coefficient, then the relationship is deemed to be lagging or leading depending on the position of the cross-correlation coefficient with the same sign as the contemporaneous coefficient.

The second part of the analysis makes use of 5-year rolling correlations covering the official phases of the South African business cycle (South African Reserve Bank, 2009) in order to

²⁶ 4-quarter cross correlations examine the correlations $corr(X_t, Y_{t-s})$ where $s = -4, -3, -2, -1, 0, 1, 2, 3, 4$ and X_t and Y_t represent two generic series.

investigate whether the phases of the business cycle have an impact on the cyclical relationships between the net capital inflows and fiscal and monetary policies.²⁷

Table 4-2: Official Turning Points of the South African Economy

Upward Phase			Downward Phase		
Start	End	Quarters	Start	End	Quarters
1993:Q2	1996:Q3	14	1996:Q4	1999:Q2	11
1999:Q3	2007:Q4	34	-	-	-

In the final part of the analysis, Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL) causality tests are conducted to determine whether the policy factors react to the capital flows or whether the capital flows react to the policy factors.

Causality among the variables is assessed using the Granger concept (Granger, 1969), which states that causal relationships can be unidirectional or bidirectional. A significant unidirectional causal relationship exists between x and y if lags of x are significant in the equation of $y(t)$, while a significant bidirectional causal relationship exists if lags of x and y are significant in the equations of $y(t)$ and $x(t)$ respectively. However, a common limitation encountered when testing for Granger causality in time-series data is that the variables must be $I(0)$ stationary. Sims *et al.* (1990) and Toda and Phillips (1993) argue that when two or more variables in the system are $I(1)$ stationary, then the traditional F -test and Wald tests used to determine whether the VAR parameters are stable and jointly zero do not have standard distributions.

Hence, Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) propose that these limitations can be overcome by employing a lag-augmented VAR model, which consists of the following steps. First, information criteria and unit root tests are used to determine the optimal number of lags (k) and the maximum order of integration ($d(max)$) of the variables in the level VAR system. Second, a lag-augmented level VAR model is estimated with a total of $p=[k+d(max)]$ lags. Finally, significant causal relationships are assessed by applying standard Wald tests to the first k coefficients in the lag-augmented system.

The TYDL analysis in this study makes use of the following three-variable VAR model:

²⁷ The start-date of the 5-year rolling correlations is the second quarter of 1989.

$$\begin{bmatrix} FP_t \\ Tbill_t \\ CF_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} FP_{t-1} \\ Tbill_{t-1} \\ CF_{t-1} \end{bmatrix} + \dots + A_k \begin{bmatrix} FP_{t-k} \\ Tbill_{t-k} \\ CF_{t-k} \end{bmatrix} + \mu_t \quad (1)$$

where FP is the fiscal policy variable, $Tbill$ is the monetary policy variable, CF are the sum of the net capital flows, A_0 is a vector of constant terms, $A_{t=1,\dots,k}$ are matrices of parameters, k is the number of lags for the VAR, and μ_t is a vector of i.i.d. Gaussian error terms.

4.4 DATA DESCRIPTION

South Africa held its first democratic election in April 1994 and thus this date is regarded as the point where there was a significant shift in the country's policy stance (Ncube and Leape, 2008; Faulkner and Loewald, 2008). Hence the analysis uses a sample that runs from the second quarter of 1994 to the end of 2007. All of the data included in this study is on a quarterly basis and was obtained from the South African Reserve Bank. The correlation analysis makes use of three capital flow components, as well as three fiscal and monetary policy factors chosen in accordance with Kaminsky *et al.* (2004).²⁸ The nine variables included in the correlation analysis have not been normalised to GDP and are measured in millions of Rands, with the exception of the inflation tax (I_Tax) and the Treasury bill rate ($Tbill$), which are measured in percentages. Kaminsky *et al.* (2004) argue that using data that is normalised to GDP when analysing the cyclical relationships between net capital flows and policy factors could produce ambiguous results because movements in GDP could offset movements in the cyclical relationships.

In accordance with the empirical literature, this study makes use of net capital inflows rather than gross capital inflows. The net capital flows are measured as the difference between gross inflows (liabilities) and outflows (assets) and consist of net direct investment (NDI), net portfolio investment (NPI), and net other investment (NOI).

The fiscal policy variables included in the cross-correlation analysis consist of government expenditure (Gov_Exp), seasonally-adjusted total national tax revenues (Tax_Rev) and the inflation tax (I_Tax).²⁹ It is anticipated that the correlations between the net capital inflows and government expenditure will be positive if there is a procyclical relationship, because heightened capital inflows are expected to be associated with increased government expenditure. Similarly, the correlations

²⁸ The Christiano-Fitzgerald filtered data is graphically presented in Appendix 4-A.

²⁹ Measured as $\pi/(1+\pi)$ where π is the inflation rate.

between the capital inflows and taxation revenues are expected to be positive if the relationship is procyclical, because heightened inflows are anticipated to be associated with an expansionary environment and thus higher taxes received. In contrast, the correlations between the capital inflows and the inflation tax are anticipated to be negative if there is a procyclical relationship because heightened capital inflows are anticipated to promote expansionary fiscal policies, resulting in a declining inflation tax.

The monetary policy variables consist of domestic credit extension (*Credit*), M1 money supply (*M1*) and the 90-day Treasury bill rate (*Tbill*). It is anticipated that the correlations between the capital inflows and domestic credit will be positive if there is a procyclical relationship, because an increase in domestic credit extension is associated with heightened capital inflows. Similarly, the correlations between the capital inflows and M1 money supply are expected to be positive if the relationship is procyclical because heightened inflows are anticipated to be associated with expansionary money supply. In contrast, the correlations between the capital inflows and interest rates will be negative if procyclical, because interest rates are expected to decline during capital inflow induced expansionary phases so as to counteract inflationary pressures. In all cases the opposite is expected to occur if the relationships are counter-cyclical. These relationships are summarised in Table 4-3:

Table 4-3: Theoretical Correlations

Policy Variables	Net Capital Inflows	
	Procyclical	Counter-cyclical
<i>Fiscal Policy:</i>		
Gov_Exp	+	-
Tax_Rev	+	-
I_Tax	-	+
<i>Monetary Policy:</i>		
Credit	+	-
M1	+	-
Tbill	-	+

- or + symbols represent a negative or positive correlation coefficient respectively.

The VAR model used to conduct the TYDL analysis includes a fiscal policy variable, a monetary policy variable, and a capital flow variable. In accordance with the literature,³⁰ the fiscal policy variable (*FP*) is measured as the real noninterest government expenditure as a percentage of seasonally-adjusted real GDP, while monetary policy is represented by the Tbill rate (*Tbill*). The capital flow variable (*CF*) is the sum of the net capital flow components measured as a percentage of seasonally-adjusted real GDP. The VAR model also includes two dummy variables to compensate for outliers among the Tbill series in the third quarter of 1998 and for the capital flows in the third quarter of 2005.

4.5 EMPIRICAL RESULTS

4.5.1 Cross-Correlation Results

The cross-correlations between the capital inflows and fiscal policy variables are summarised in Table 4-4 overleaf. The results show that net portfolio investment is acyclical in relation to all of the fiscal policy factors, implying that the bulk of South Africa's net capital inflows have no cyclical relationship with fiscal policy. Net direct investment also has no cyclical relationship with government expenditure, but is counter-cyclically associated with taxation revenues. Hence, this indicates that South Africa's FDI inflows do not significantly increase government receipt of taxation from foreign-owned companies. There are two possible reasons for this result. First, South Africa does not offer significant tax incentives for FDI investment compared to other similar countries and thus is not considered an attractive FDI investment destination (UNCTAD, 2006: 277-278).³¹ Second, South Africa's FDI inflows tend to be merger and acquisition (M&A) equity-based transactions (Arvanitis, 2005), which thus precludes taxation received from the wages associated with capital-intensive FDI. Hence, these factors suggest that South Africa could potentially increase the magnitude of FDI inflows by reforming the country's onerous and opaque tax regime so as to be in line with similar emerging countries, and by designing industrial pull policies that will attract a higher proportion of 'greenfield' FDI.

³⁰ For example see of Gavin and Perotti (1997), Braun (2001), Dixon (2003), Lane (2003b), Calderon and Schmidt-Hebbel (2003), and Cardarelli *et al.* (2010).

³¹ South Africa has amongst the highest nominal corporate tax rates of countries with similar FDI attractiveness (Kransdorff, 2010).

Net other inflows are counter-cyclically associated with government expenditure and procyclically associated with tax revenues. Hence the debt flows react negatively to higher government expenditure but positively to higher tax revenues. This result accords with Burger *et al.* (2012) who find that the country's fiscal policy is reactive to the sustainability of interest costs. Furthermore, net direct investment and net other inflows are found to have a counter-cyclical association with the inflation tax, which implies that foreign investors use the capital movements as hedging instruments to mitigate the effects of inflation taxes in accordance with Sayek (2009). In addition, all of the significant cyclical relationships lead the fiscal policy factors with the exception of net direct investment and tax revenues, which are contemporaneous.

Thus in summary, the cyclical relationships between net direct investment and net other investment and fiscal policy, tends to be counter-cyclical, while the cyclical relationship between net portfolio investment and fiscal policy tends to be acyclical. Hence, these results suggest that for South Africa, the use of fiscal restraint as a policy tool to mitigate the macroeconomic impacts of capital inflow surges could prove problematic for three reasons: first, South Africa's post-liberalisation government has been under pressure to improve the livelihoods of the majority of the country's citizens and thus policy priorities have shifted towards restructuring government expenditure towards social upliftment to the extent that South Africa currently has amongst the highest levels of expenditure on social welfare in the world (Fedderke, 2010); second, South Africa has a low savings rate, which has steadily declined from 24.2% of GDP in 1985, to 16.8% in 1994, and to 14.1% in 2007; and thus the country is unable to acquire a fiscal surplus during good times for use during contractions; and third, the cross-correlations show that the responses between the net capital flow components and the fiscal policy factors are inconsistent, which suggests that domestic policy makers may have difficulty controlling the different capital flow components using fiscal policy tools.

Table 4-4: Fiscal Policy Cross-Correlation Results

Capital Flows	Fiscal Policy Cross Correlations								
	Lag				0	Lead			
	-4	-3	-2	-1		1	2	3	4
<i>Cross Correlation with Gov_Exp:</i>									
DIL	-0.059	-0.155	-0.144	-0.027	0.109	0.164	0.087	-0.053	-0.136
PIL	-0.141	-0.139	-0.093	-0.016	0.053	0.062	0.042	0.048	0.114
OIL	0.157	0.284	0.235	0.008	-0.245	-0.326	-0.163	0.108	0.262
<i>Cross Correlation with Gov_Rev:</i>									
DIL	-0.031	-0.066	-0.152	-0.262	-0.317	-0.243	-0.021	0.259	0.443
PIL	0.032	0.120	0.224	0.273	0.232	0.141	0.057	0.027	0.051
OIL	-0.045	-0.283	-0.387	-0.266	0.034	0.338	0.458	0.315	-0.001
<i>Cross Correlation with I_Tax:</i>									
DIL	0.062	0.230	0.202	0.009	-0.187	-0.218	-0.035	0.220	0.324
PIL	0.158	0.118	0.049	-0.018	-0.051	-0.030	0.014	0.047	0.060
OIL	-0.449	-0.477	-0.210	0.234	0.585	0.589	0.210	-0.333	-0.699

Significant contemporaneous correlation coefficient > 0.28 (5% significance level). The most significant correlations in excess of 2-standard error bounds are indicated in bold.

The cross-correlations presented in Table 4-5 overleaf further show that the cyclical relationships between net capital inflows and monetary policy variables display similar characteristics as the fiscal policy correlations whereby net portfolio investment is the most consistent, while net direct investment and net other investment are more varied. However, whereas the cyclical relationship between net portfolio investment and fiscal policy is consistently acyclical, the cyclical relationship with monetary policy is consistently procyclical. This result implies that the bulk of South Africa's net capital inflows behave in accordance with the 'when-it-rains-it-pours syndrome' of Kaminsky *et al.* (2004) whereby portfolio investment increases when monetary policy is loosened and decreases when monetary policy is tightened. Net direct investment is found to be counter-cyclically associated with credit; procyclically associated with money supply; and has no association with the Tbill rate. Hence, these results show that net direct investment does not have a consistent cyclical relationship with monetary policy. Net other inflows are procyclically associated with credit, but are counter-cyclically associated with money supply and the Tbill rate, which suggest that the short-term flows focus on the returns to be gained from heightened private sector credit extension or from the rising rates of return. In addition, net portfolio inflows lag credit and money supply, while net direct investment and net other investment are either contemporaneous or lead the monetary policy factors. This suggests that the net portfolio inflows are reactively pulled into the country based on monetary policy dynamics, and consequently, South Africa's policy makers are

possibly in a better position to control the country's capital flows using monetary policy rather than fiscal policy.

Table 4-5: Monetary Policy Cross-Correlation Results

Capital Flows	Monetary Policy Cross Correlations								
	Lag					Lead			
	-4	-3	-2	-1	0	1	2	3	4
<i>Cross Correlation with Credit:</i>									
DIL	0.155	0.165	-0.033	-0.322	-0.485	-0.364	0.003	0.386	0.511
PIL	0.008	0.142	0.373	0.520	0.452	0.205	-0.059	-0.188	-0.140
OIL	-0.213	-0.213	-0.116	0.116	0.386	0.499	0.330	-0.044	-0.367
<i>Cross Correlation with M1:</i>									
DIL	-0.409	-0.590	-0.438	-0.041	0.340	0.448	0.210	-0.167	-0.388
PIL	0.107	0.337	0.447	0.384	0.193	-0.015	-0.092	-0.011	0.144
OIL	0.329	0.282	0.029	-0.292	-0.453	-0.296	0.113	0.520	0.646
<i>Cross Correlation with TBill:</i>									
DIL	0.123	0.196	0.138	-0.016	-0.156	-0.182	-0.061	0.124	0.245
PIL	0.368	0.237	-0.051	-0.332	-0.436	-0.284	0.004	0.224	0.225
OIL	-0.446	-0.450	-0.150	0.292	0.582	0.488	0.053	-0.430	-0.625

Significant contemporaneous correlation coefficient > 0.28 (5% significance level). The most significant correlations in excess of 2-standard error bounds are indicated in bold.

4.5.2 Rolling Correlations

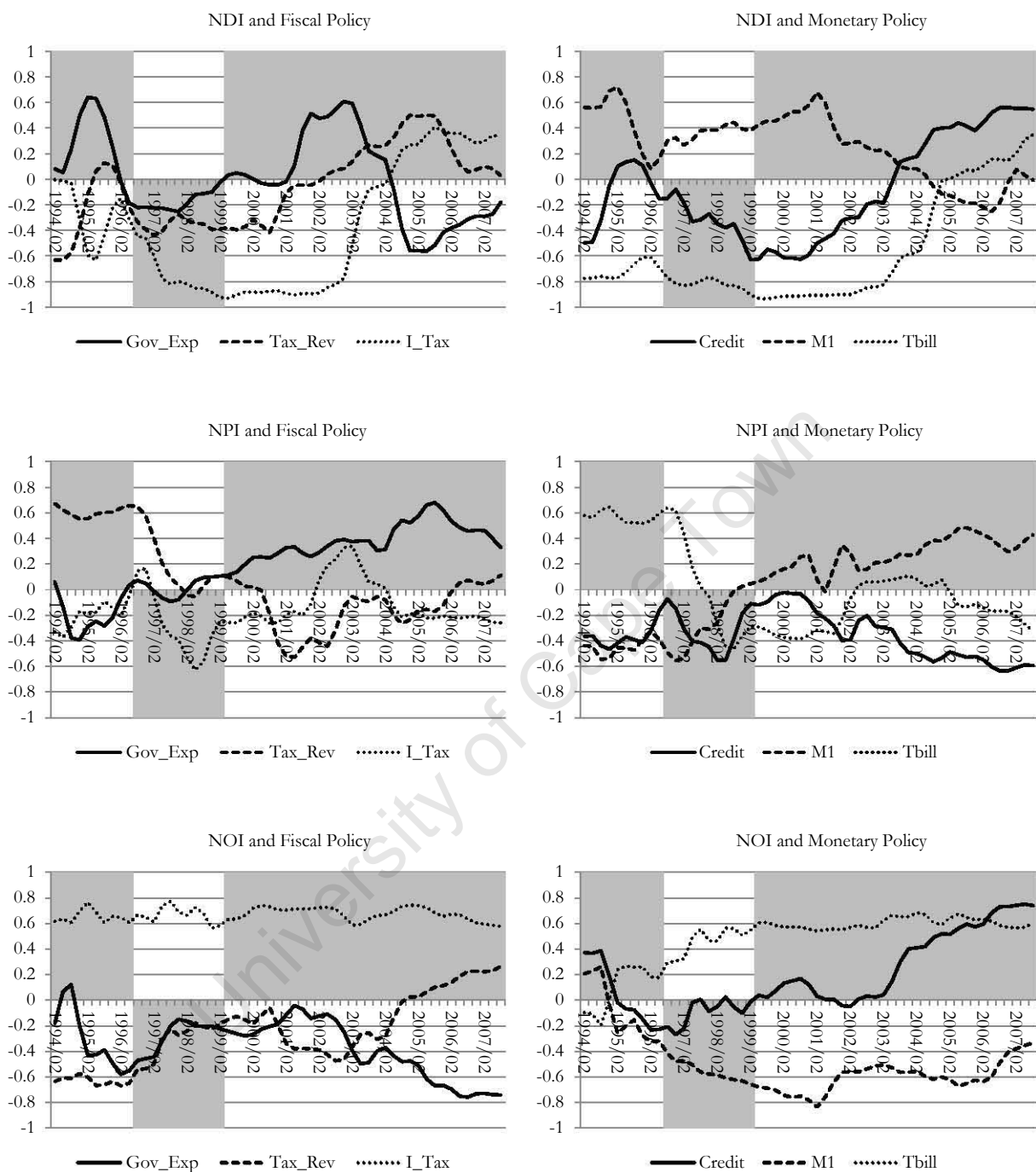
The results of the 5-year rolling correlations are graphically presented in Figures 4-1. In addition, Table 4-6 presents a summary of the proportion of time in a particular business cycle phase that capital inflows and policy variables demonstrate a procyclical relationship in accordance with Table 4-3.

With regards to the relationships between the net capital inflows and fiscal policy factors, net direct investment is more procyclically associated with government expenditures (*Gov_Exp*) and taxation revenues (*Tax_Rev*) during down-phases, but is procyclically associated with the inflation tax (*I_Tax*) during up-phases. In contrast, net portfolio inflows are more procyclical during up-phases while net other inflows are most significantly procyclical during down-phases (including the inflation tax).

With regards to the relationships between the net capital inflows and the monetary policy factors, net direct investment and net portfolio inflows tend to be more procyclically associated with credit during up-phases; while net other flows are inconsistent. The cyclical relationships between net direct investment and money supply and the Tbill rate tends to be more procyclical during up-phases, while net other inflows are more procyclical during down-phases. Net portfolio inflows in contrast, do not demonstrate a more procyclical relationship with money supply and Tbills during up- or down-phases.

Thus, these results indicate that post-1994, the cyclical relationships between net direct investment, portfolio inflows and the fiscal policy factors have tended to be procyclical during up-phases while other inflows have tended to be more procyclical during down-phases. In contrast, the cyclical relationships between net direct investment, net portfolio inflows and the monetary policy factors tend to be more procyclical during up-phases of the business cycle, while other inflows tend to be more procyclical during down-phases.

Figure 4-1: Fiscal and Monetary Policy Rolling Correlations³²



³² Gray shading represents official up and down phases of the South African business cycle.

Table 4-6: Percentage of Time within Business Cycle Phase Correlations

Period	Phase	Fiscal Policy Factors				Monetary Policy Factors			
		Gov_Exp	Tax_Rev	I_Tax	Total	Credit	M1	Tbill	Total
FDI Flows (NDI):						FDI Flows (NDI):			
1994:Q2-1996:Q3	Up	80%	30%	100%	70%	40%	60%	100%	67%
1996:Q4-1999:Q2	Down	100%	100%	0%	67%	100%	0%	0%	33%
1999:Q3-2007:Q4	Up	47%	65%	59%	57%	50%	32%	68%	50%
Portfolio Flows (NPI):						Portfolio Flows (NPI):			
1994:Q2-1996:Q3	Up	10%	100%	100%	70%	0%	0%	0%	0%
1996:Q4-1999:Q2	Down	45%	18%	18%	27%	100%	82%	45%	76%
1999:Q3-2007:Q4	Up	100%	29%	74%	68%	0%	97%	68%	55%
Other Flows (NOI):						Other Flows (NOI):			
1994:Q2-1996:Q3	Up	20%	0%	0%	7%	40%	30%	30%	33%
1996:Q4-1999:Q2	Down	100%	100%	100%	100%	82%	100%	100%	94%
1999:Q3-2007:Q4	Up	0%	35%	0%	12%	94%	0%	0%	31%

Percentages indicate the number of quarters that the correlations are procyclical in accordance with Table 4-2.

4.5.3 TYDL Analysis

The final part of the analysis of the relationship between the capital inflows and South Africa's fiscal and monetary policies is to determine whether the capital flows drive policy, or vice versa. This is achieved using the TYDL test for non-causality.

The first step of the TYDL approach involves determining the maximum order of integration ($d(max)$) of the variables included in the VAR system. The results of the Augmented Dickey-Fuller (1979, 1981) and Phillips-Perron (1988) unit root tests are presented in Table 4-7 and show that the fiscal policy variable (FP) is $I(0)$ stationary, while the monetary policy variable ($Tbill$) is $I(1)$ stationary.³³ In the case of the net capital flows (CF), the ADF and PP tests produce conflicting results. According to the ADF test, net capital flows are $I(1)$ stationary but according to the PP test, net capital flows are $I(0)$ stationary. Hence, in order to resolve this disparity, a KPSS test (Kwiatkowski *et al.*, 1992) was conducted and the results find that the net capital flows are $I(1)$ stationary. Thus, the unit root tests show that $d(max)=1$.

³³ See Section 2.4 for an explanation of the unit root and stationarity tests.

Table 4-7: Unit Root Test Results

Variable	ADF with Constant		PP with Constant	
	I(0)	I(1)	I(0)	I(1)
CF	-0.710	-4.092 ***	-3.820 ***	-14.779 ***
FP	-2.992 **	-3.876 ***	-5.451 ***	-12.040 ***
Tbill	-1.308	-3.971 ***	-1.604	-5.631 ***

The ADF unit root test included a maximum of 4 lags chosen on the basis of the Akaike Information Criterion (AIC). ***, **, and * represents significance at the 1%, 5%, and 10% levels respectively.

In the next step of the TYDL approach, the level VAR model is specified and tested for misspecification using standard diagnostic tests. The plots of the inverse roots of AR characteristic polynomials presented in Figure 4-2 indicate that the VAR model is stable. In addition, the LM-Test statistics and normality tests presented in Table 4-8 show that there is no significant residual serial correlation and that the empirical model is correctly specified.

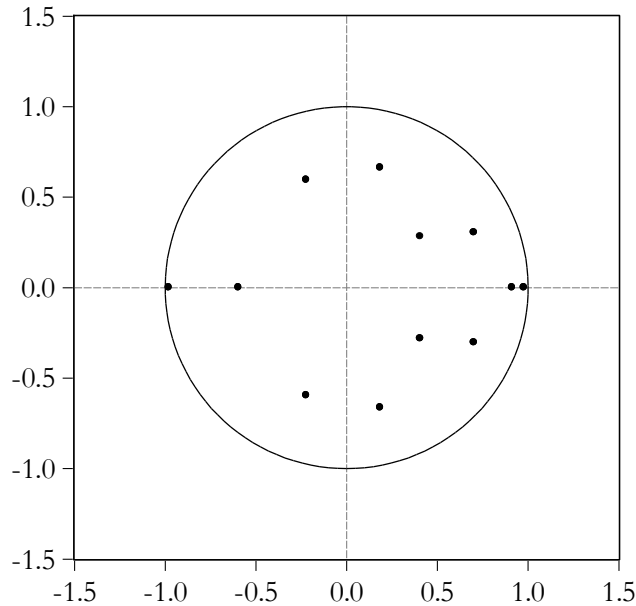
Figure 4-2: Inverse Roots of AR Characteristic Polynomials

Table 4-8: VAR Diagnostics

Serial Correlation Test			Joint Normality Tests		
Lags	LM-Stat	Prob.	Component	Chi-sq	Prob.
1	12.361	0.194	Skewness	0.865	0.834
6	3.886	0.919	Kurtosis	7.968	0.047
12	7.033	0.634	Jarque-Bera	8.833	0.183

Thereafter, the optimal lag length (k) is determined using the AIC and HQ information criterion, which find that $k=4$ lags. Having identified $d(max)=1$ and $k=4$, the final stage of the TYDL analysis involves re-specifying the level VAR with one extra lag and then applying standard Wald tests to the first four coefficients in the lag-augmented system.³⁴

The results of the TYDL non-causality tests are presented in Table 4-9 overleaf and show that there is a highly significant unidirectional causal relationship running from monetary policy to fiscal policy but a weakly significant causal relationship running from fiscal policy to monetary policy. In addition, capital flows are found to have a moderately significant unidirectional relationship with fiscal policy. Thus, fiscal policy reacts both to monetary policy and capital flows, but monetary policy does not have a significantly causal relationship with fiscal policy or capital flows. However, the results show that although the capital flows do not react to fiscal policy, they do have a highly significant unidirectional relationship with monetary policy. Thus in summary, fiscal policy reacts to monetary policy and capital flows, while capital flows react to monetary policy.

³⁴ The *Eviews 6* software used to conduct the analysis requires that the lag-augmented VAR is first re-specified as a Seemingly Unrelated Regression (SUR) system before the Wald tests can be undertaken.

Table 4-9: TYDL Non-Causality Test Results

Dependant Variable	Modified Wald Statistics		
	FP	Tbill	CF
FP	---	8.240 <i>0.083 *</i>	3.404 <i>0.493</i>
Tbill	15.973 <i>0.003 ***</i>	---	16.355 <i>0.003 ***</i>
CF	12.118 <i>0.017 **</i>	3.592 <i>0.464</i>	---

Notes: The $[k + d(max)]$ th order level VAR was estimated with $d(max) = 1$ for the order of integration and lag length selection of $k = 1$. Reported estimates are asymptotic Wald statistics. Values in *italics* are p -values. ***, **, and * represent significance at the 1%, 5%, and 10% level respectively.

4.6 CONCLUSION

This study used Christiano-Fitzgerald filtered correlation analysis and Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL) causality tests to investigate the cyclical relationships between South Africa's net capital inflows and fiscal and monetary policies. With regards to fiscal policy, the correlation analysis shows that the cyclical relationships between net direct investment and net other investment, and fiscal policy tend to be counter-cyclical. In contrast, the cyclical relationship between net portfolio investment and fiscal policy tends to be acyclical, which implies that the bulk of South Africa's net capital inflows have no cyclical relationship with fiscal policy. In addition, all of the significant cyclical relationships lead the fiscal policy factors.

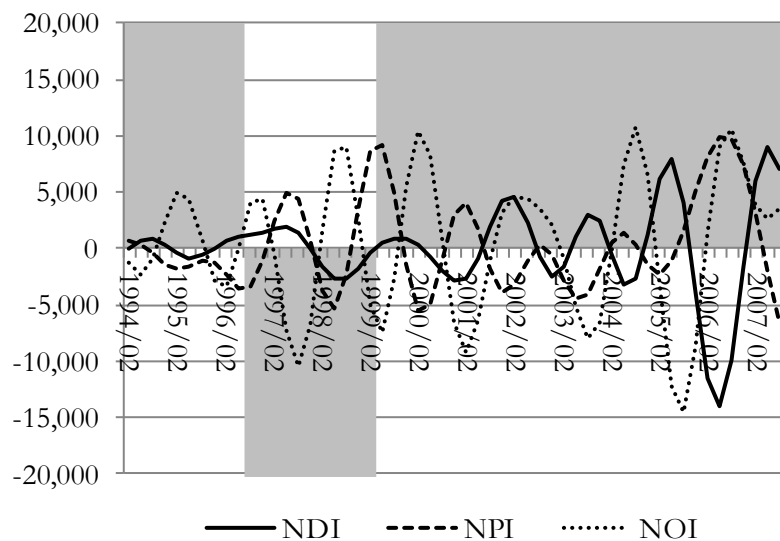
Net direct investment is also found to have no cyclical relationship with government expenditure but is counter-cyclically associated with taxation revenues, which indicates that South Africa's net direct investment inflows do not significantly increase government receipt of taxation from foreign-owned companies. Furthermore, both net direct investment and net other inflows are found to have a counter-cyclical association with the inflation tax, which suggests that foreign investors use the capital movements as hedging instruments to mitigate the effects of inflation taxes. An examination of the impacts of the business cycle phases on the cyclical relationships between the net capital inflows and the fiscal policy factors shows that net direct investment and net portfolio inflows tend to be procyclical during up-phases, while other inflows tend to be more procyclical during down-phases.

With regards to monetary policy, the results show that the cyclical relationships between net portfolio inflows and monetary policy are procyclical and lagging, which implies that the bulk of South Africa's net capital inflows are reactive and behave in accordance with the 'when-it-rains-it-pours syndrome' of Kaminsky *et al.* (2004) whereby portfolio investment increases when monetary policy is loosened and decreases when monetary policy is tightened. In contrast, net direct investment does not have a consistent cyclical relationship with monetary policy. However, net other inflows are found to be procyclically associated with credit, but are counter-cyclically associated with money supply and the Tbill rate, which suggests that the short-term flows focus on the returns to be gained from heightened private sector credit extension or from the rising rates of return. Examination of the impacts of the business cycle phases on the cyclical relationships between the net capital inflows and the monetary policy factors reveals that net direct investment and net portfolio inflows tend to be more procyclical during up-phases of the business cycle, while other inflows tend to be more procyclical during down-phases. Finally, the results of the TYDL non-causality tests show that fiscal policy reacts to monetary policy and capital flows, while capital flows react to monetary policy.

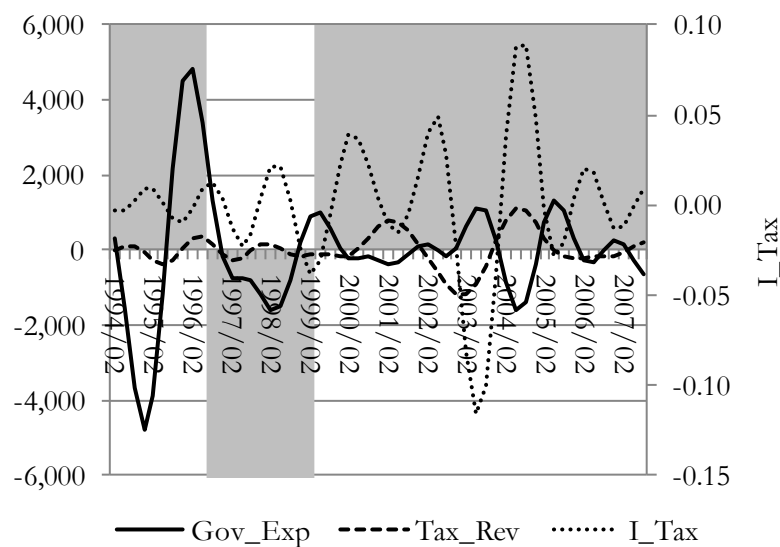
Hence, three policy conclusions arise from these results. First, given the country's high welfare expenditure, low savings rate, and the inconsistent relationships between the capital flows and fiscal policy factors, the use of fiscal restraint as a fiscal policy tool is likely to prove problematic. Second, stability of South Africa's capital flows is reliant on a predictable monetary policy outlook. Third, South Africa's policy makers are in a better position to control the country's capital flows using monetary policy than fiscal policy.

APPENDICES

Appendix 4-A: Capital Inflows³⁵

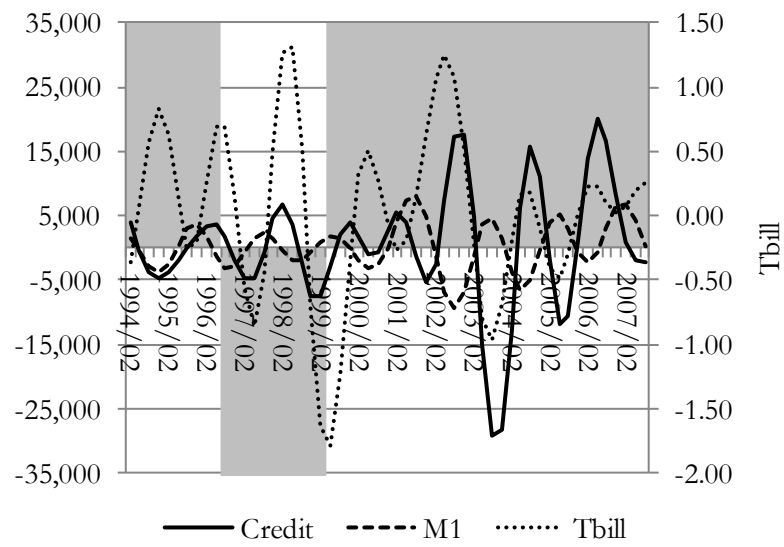


Appendix 4-B: Fiscal Policy Variables



³⁵ Gray shading represents official up and down phases of the South African business cycle.

Appendix 4-C: Monetary Policy Variables



CHAPTER 5

THE EFFECTS OF CAPITAL INFLOWS ON SOUTH AFRICA'S MACROECONOMY AND TRANSMISSION MECHANISMS

5.1 INTRODUCTION

Since the 1990s one of the most prominent factors that have shaped the international financial environment has been the rapid expansion of capital flows to developing countries, mostly due to financial sector liberalisation (Eichengreen, 2004). However, there are two opposing views as to whether the capital inflows are beneficial for developing countries or detrimental. On the one hand, it is argued that capital inflows benefit recipient countries through heightened domestic investment, financial sector development, improved liquidity, and international integration (Kim and Yang, 2008). On the other hand, studies of the impacts of capital flows in Latin America and Asia have shown that large inflows can swamp the recipient country's financial system, stimulating excessive credit extension, a consumption boom, and asset price bubbles (Agosin, 1994; Dooley, 1994; Ffrench-Davis *et al.*, 1994; Gavin *et al.*, 1995; Ffrench-Davis and Griffith-Jones, 1996; World Bank, 1997; Calvo *et al.*, 2003; Reinhart and Reinhart, 2008).

Furthermore, reactions to the capital inflows are split between those that advocate policy intervention and those who do not. Those in favour argue that if monetary policymakers do not intervene, then the rapid monetary expansion and excessive domestic demand for imports will cause inflationary pressure, a widening current account deficit, and appreciation of the exchange rate (Berument and Dincer, 2004).³⁶ Eventually, worsening levels of bad debt may raise the country's risk profile to the extent that international financing ceases, capital flows reverse, domestic credit and investment collapse, and boom turns to bust (Caballero and Krishnamurthy, 2006). The common policy instruments advocated to counteract these dynamics include capital controls, removal of

³⁶ Whether monetary policymakers should respond to rising asset prices is still controversial, however, recent studies in favour of monetary policy intervention include Filardo (2001 and 2004), Bordo and Jeanne (2002), Borio and Lowe (2002 and 2004), Cecchetti *et al.* (2000 and 2002), Roubini (2006), White (2006), and Gochoco-Bautista (2009). See Smal and de Jager (2001) for an exploration of the South African monetary policy transmission mechanism.

restrictions on capital outflows, trade liberalisation, exchange rate flexibility, reserve accumulation and sterilisation, and tight fiscal policy (Fernandez-Arias and Montiel, 1996).

Advocates in favour of non-intervention argue that the negative effects of capital inflows are due to financial market distortions arising from insufficient deregulation, information asymmetries, and excessive government interference.³⁷ Thus, the non-interventionists argue for the strengthening of prudential supervision and the removal of over-regulation rather than increased intervention. Furthermore, it is argued that inflation targeting rather than asset price targeting offers a better stabilising mechanism (Gilchrist and Leahy, 2002).

Hence, these opposing views raise important questions for South Africa, including: (i) what are the macroeconomic impacts of the different forms of capital inflows; (ii) how does the central bank respond; and (iii), do capital inflows lead to a surge in credit extension, asset prices, and household consumption expenditure? In order to investigate these questions further, the remainder of this chapter is laid out as follows: Section 5.2 presents a brief discussion of the stylised facts relating to South Africa's capital inflows, macroeconomic effects, and transmission mechanisms; Section 5.3 reviews the related literature; Section 5.4 briefly describes the data; Section 5.5 explains the empirical models used to conduct the analysis; Section 5.6 presents and discusses the results of the empirical analysis; and the chapter concludes with a summary of the findings in Section 5.7.

5.2 STYLISTED FACTS ON CAPITAL INFLOWS AND THE SOUTH AFRICAN ECONOMY POST-1995

This section discusses some key facts about the South African economy covering the period from the country's financial liberalisation in the second quarter of 1995 to 2007 in order to gain an understanding of the effects of capital inflows on the country's macroeconomy and transmission mechanisms.

Figure 5-1(a) shows that South Africa experienced a wave of capital inflows following political and financial liberalisation in the mid-1990s, with inflows ballooning from R32.4 billion in the second quarter of 1995 to a record R201.7 billion in 2006. Unfortunately, the bulk of these inflows have been in the form of 'hot' flows rather than FDI. Over the twelve-year period, capital inflows totalled R937.9 billion, but of this amount only 22% was FDI while 57.2% was portfolio inflows and

³⁷ Recent studies opposed to policy intervention based on asset prices include Schwartz (2002), Bernanke and Gertler (1999 and 2001), Gilchrist and Leahy (2002), and Goodfriend (2003).

the remaining 20.8% was other inflows. In addition, 63.9% (R599.2 billion) of the R937.9 billion in total capital inflows occurred in the few years after 2003.

Portfolio inflows are usually tied to exchange rate movements whereby inflows cause the currency to appreciate and outflows cause the currency to depreciate. However, despite the robust capital inflows, Figure 5-1(b) shows that the Rand/U.S. dollar exchange rate has steadily depreciated from an average of R3.65 to the dollar in 1995 to R7.05 to the dollar in 2007. In addition, during the intervening years, the country experienced currency crises in 1996, 1998, 2001, and 2006.³⁸

Figure 5-1(c) shows that during the time that South Africa received substantial capital inflows, domestic savings as a percentage of real GDP declined from an average of 16.5% in 1995 to 14.1% in 2007. Consequently, the country has become increasingly reliant on capital inflows to finance its current account deficit, which has widened from -1.7% of real GDP in 1995 to -7.3 in 2007. Luckily, the magnitude of capital inflows has exceeded the amount needed to finance the current account deficit and thus, as can be seen from Figure 5-1(b), central bank reserves increased from an average of just 1.5% of real GDP in 1995 to 16.5% of GDP in 2007. Figure 5-1(b) also shows that M2 money supply has steadily risen from an average of 28.6% as a percentage of real GDP in 1995, to 103.4% in 2007. Thus, although the central bank has continued to build up reserves, sterilisation has largely been periodic.

Nevertheless, Figures 5-1(c) and 5-1(d) show that post-2003, as the central bank lowered interest rates and accelerated the build-up of reserves, heightened capital inflows stimulated robust credit extension, which increased from an average of 83.7% of real GDP in 2003 to 128.8% of real GDP in 2007. Conversely, household consumption expenditure increased from 48.3% of real GDP in 2003 to 53.7% in 2007. Furthermore, Figure 5-1(e) shows that this heightened economic activity has stimulated imports and new vehicle sales more than retail sales, especially after 2003. The retail sales index increased by just 7.4% over the period of 1995 to 2003 (from an average of 64.8 to 69.6) before accelerating by 29.7% from 2004 to 2007 (from 77.1 to 100.0 in 2007). The new vehicle sales index declined by 3.0% from 1995 to 2003 (from an average of 111.2 to 108.1) but then jumped by 50.4% from 2004 to 2007 (from 131.8 to 198.2 in 2007). Imports as a percentage of real GDP increased by just 1.8% from an average of 33.1% in 1995, to 33.7% of GDP in 2003, and then increased by 23.2% from 2004 to 2007 (increasing from 37.1% to 45.7%). Thus over the period from 1995 to 2007, the retail sales index grew by 35.2%, while the new vehicle sales index and imports as a percentage of real GDP increased by 78.2% and 38.1% respectively.

³⁸ For an examination of the circumstances and effects of these crises see Aron and Elbadawi (1999), Myburgh Commission (2002), Bhundia and Gottschalk (2003), Bhundia and Ricci (2006), Duncan and Liu (2009), and Lipuma and Koeble (2009).

Figure 5-1(f) shows that following liberalisation, share prices and house prices appreciated rapidly, especially after 2003. The Johannesburg All-Share Index (ALSI) rose by 56.1%, from an average of 5,666.6 in 1995, to 8,845.9 in 2003, and then ballooned to 28,452.4 in 2007. Over the same period, the Standard Bank house price index jumped by 84.4% from an average of 164,000 in 1995, to 302,500 in 2003, and then rose by a further 44.8% in just four years, reaching 577,500 in 2007. In contrast, the All-Bond Index (ALBI) did not appreciate as drastically, increasing 37.9% (from an average of 123.9 in 1995 to 170.9 in 2003) before declining by 1.8% over the next four years (reaching 167.9 in 2007).

University of Cape Town

Figure 5-1: Capital Inflows and Macroeconomic Factors

Fig. 5-1(a)

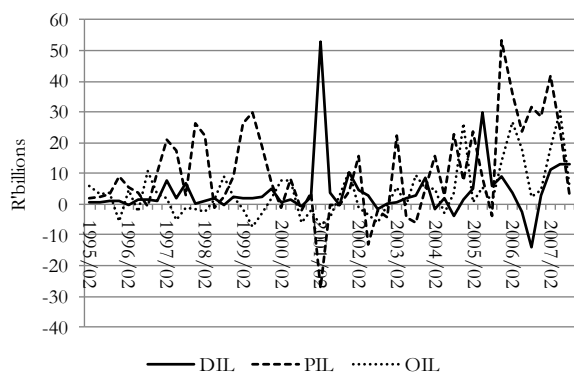


Fig. 5-1(b)

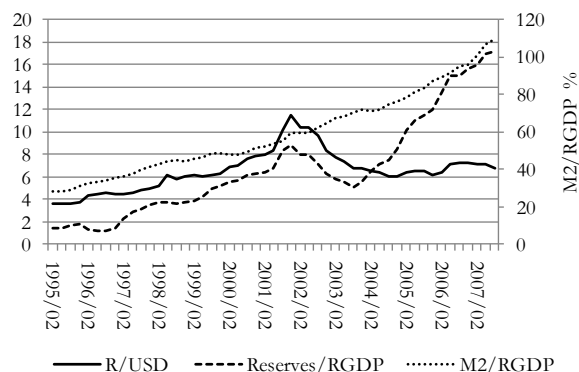


Fig. 5-1(c)

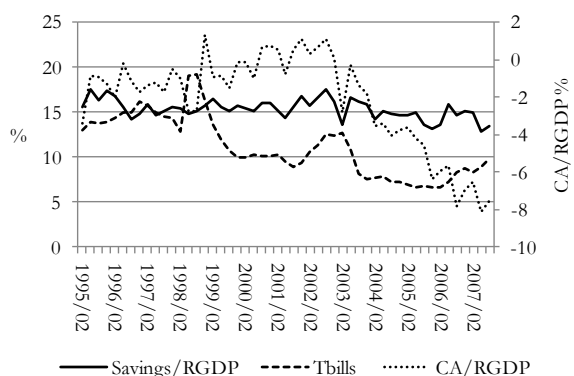


Fig. 5-1(d)

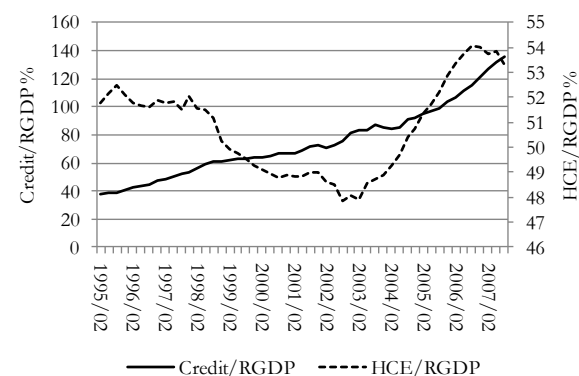


Fig. 5-1(e)

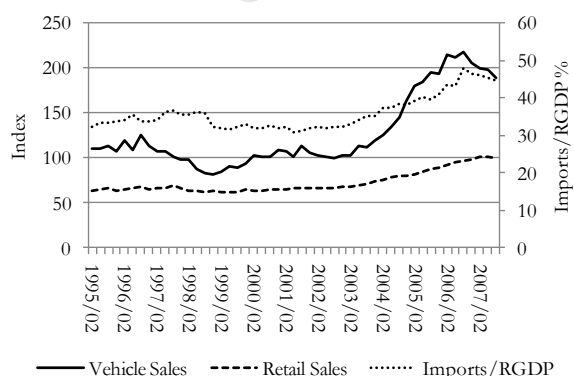
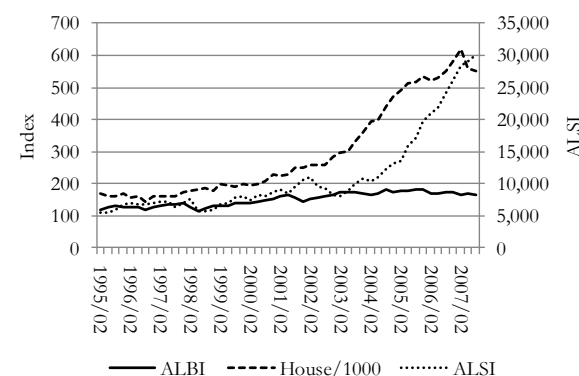


Fig. 5-1(f)



5.3 LITERATURE REVIEW

Reisen (1998) argues that capital inflows can benefit a recipient country by adding to domestic savings, raising economic efficiency, and allowing for increased risk-sharing. Thus in theory, emerging countries with developed stock markets should be able to supplement their low levels of domestic savings with foreign capital. Mody and Murshid (2005) find that for each U.S. Dollar of long-run inflow, domestic investment in 60 developing countries rose by 66 cents. Similarly, Bosworth and Collins (1999), report that for each U.S. Dollar of foreign investment, domestic investment increased by 52 cents for developed countries, and by 47 cents for emerging countries. Furthermore, it is found that in emerging countries FDI had the most significant impact, increasing domestic investment by between 68 and 90 cents for each U.S. Dollar of investment, compared to 25 to 44 cents for bank debt, and 15 to 25 cents for portfolio investment.

However, Goldin and Reinert (2005: 455) point out that the link between foreign capital inflows and heightened domestic investment is highly idealized as it does not consider intervening factors such as political risk, default risk, limitations of available human capital and technology, and differences in institutional quality. In addition, capital inflows are also associated with macroeconomic disruptions that include distorted consumption and production channels (Reisen and Soto, 2001), as well as transmission effects such as moral hazard induced excessive lending (McKinnon and Pill, 1997), ‘crowding out’ of alternative investment (Agosin and Mayer, 2000), and asset price bubbles (Sarno and Taylor, 1999a).

Capital inflows can impact asset prices in three ways: first, directly, by increasing the demand for assets; second, by increasing money supply and liquidity; and third, by generating economic booms (Kim and Yang, 2009). On a theoretical level, Caballero and Krishnamurthy (2006) argue that asset price bubbles arise in emerging countries because of insufficient stores of wealth. Thus, excess capital may generate asset price bubbles because there is too much capital chasing too few investment opportunities domestically. In addition, the capital may lead to large outflows in search of better investment opportunities abroad. In contrast, Ventura (2011) argues that asset price bubbles are a substitute for capital inflows and thus may have beneficial effects, including improving the international allocation of capital, and reducing rate of return differentials across countries. However, Ventura also finds that bubbles tend to result in macroeconomic instability, because they compound the effects of productivity shocks and foster expectational shocks.

With regard to house prices, Tomura (2010) examines the relationship between capital flows and boom-bust cycles in house prices and shows that during a high growth phase, a shortage of

domestic credit supply is offset by capital inflows. This supplementing effect amplifies domestic interest rate fluctuations and makes current house prices sensitive to household expectations. Consequently, a rise in expected future house prices during the high growth phase exaggerates the house price boom, while a correction of expected house prices results in a house price bust.

Empirical evidence has shown that the banking sector acts as a fundamental conduit in the boom-bust cycle (Sachs and Woo, 2000; Krugman, 1998; Mishkin, 1999; Sarno and Taylor, 1999a; Kaminsky and Reinhart, 1999; Reinhart and Rogoff, 2008; Zhou, 2008). Banks that are under-capitalised or have poor credit assessment oversight tend to have a high moral hazard incentive to undertake risky and excessive credit extension. This in turn fuels stock and property booms, which leads to increased collateral values and thus further sustains the credit boom (Jansen, 2003). Goldfajn and Valdes (1995) argue that domestic banks amplify the impacts of international interest rate changes and capital inflows, leading to an exaggerated business cycle that eventually ends in a bank run, a financial crisis, and capital outflows. Dekle and Kletzer (2001) show that in the boom stage, capital inflows and bank debt increase more than domestic investment and output. Domestic credit market inefficiencies then increase the ratio of non-performing loans of banks relative to the stock market value, resulting in a loss of investor confidence and a liquidity crisis.

Equity price bubbles have been identified empirically in France, Germany, Japan, the U.K., and the U.S. (Capelle-Blancard and Raymond, 2004), as well as in developing countries in Latin America (Herrera and Perry, 2001; Sarno and Taylor, 2003), Asia (Sarno and Taylor, 1999b), and countries in the IFC Emerging Market Investable Index (Doffou, 2004).³⁹ In the case of South Africa, Zhou and Sornette (2009) find that there was an equity bubble in the Johannesburg Stock Exchange (JSE) from 2003 to 2006, particularly among the All-Share Index (J203) and Financial Index (J580), and the Investec (INL and INP) and Netcare Health (NTC) stocks.

Bubbles in house prices have been identified in the U.S. (Abraham and Hendershott 1996), the U.K. and Spain (Ayuso and Restoy, 2006), Hong Kong (Chan *et al.*, 2001), and Korea (Kim and Min, 2011). In addition, over-valued house prices have been reported in the housing markets of Australia (Bourassa and Hendershott 1995), Sweden (Hort, 1998), New Zealand (Bourassa *et al.*, 2001 and 2009), and Canada (Tumbarello and Wang, 2010); and city-specific speculative behaviour has been reported in the housing markets of London (Levin and Wright, 1997), Paris (Roehner, 1999), Dublin, (Roche, 2001), Shanghai (Hui and Yue, 2006), and Las Vegas (Zhou and Sornette, 2008). With regard to South Africa, Balcilar *et al.* (2011) test all five of the domestic housing market segments (large-middle, median-middle, small-middle, luxury, and affordable) and finds that over the

³⁹ See Gurkaynak (2005) for a description and critique of the various econometric techniques used to identify asset price bubbles.

period from 1970 to 2009, all of the housing segments demonstrate significant non-linearity, thus supporting the over-reaction behaviour as posited by Tomura (2010).

5.4 METHODOLOGY

The examination of the effects of foreign capital inflows on South Africa's macroeconomy and on the transmission mechanisms of credit extension, asset prices, and household consumption expenditure is conducted using four vector error correction models (VECM) with impulse response analysis.

Prior to formulating the empirical models, the stationarity of the variables is assessed using unit root tests. Thereafter, if the variables are found to be differenced stationary then the next step is to test for cointegration. Following Engel and Granger (1987), variables are termed cointegrated if they trend together over time. Testing for cointegration and the identification of the potential number of cointegrating equations is undertaken using the trace test and the maximum eigenvalue test (Johansen, 1995).⁴⁰ The null hypothesis of the trace test is that the number of cointegrating equations is less than or equal to the number of cointegrating vectors while the null hypothesis of the maximum eigenvalue test is that the number of cointegrating vectors is equal to the number of cointegrating relationships.

If no cointegration is found then the empirical analysis can be undertaken using the unrestricted VAR approach of Sims (1980), which can be described by the following specification:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + \mu_t \quad (1)$$

where y_t is a vector of k potentially endogenous variables, p is the number of lags, A_i is a $(k \times k)$ matrix of parameters, and μ_t is an unobservable error term. On the other hand, if the I(1) variables are found to be cointegrated then equation (1) can be re-specified as a VECM with the following specification (Johansen, 1988):

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \dots + \Gamma_{p-1} \Delta y_{t-p+1} + \mu_t \quad (2)$$

where $\Pi = -(I_k - A_1 - \dots - A_p)$ and $\Gamma_i = -(A_{i+1} + \dots + A_p)$.

⁴⁰ See section 2.4 for a detailed explanation of the trace and maximum eigenvalue cointegration tests.

Hence equation (2) is obtained from the VAR equation (1) by subtracting y_{t-1} from both sides and re-arranging the terms. All of the variables are at most I(1) and as a result only Πy_{t-1} contains the I(1) variables, which implies that Πy_{t-1} must contain the cointegrating relationships since it is I(0) (Lutkepohl and Kratzig, 2004). Consequently, Πy_{t-1} is often referred to as the long-run relationship and Γ is referred to as the short-run relationship (Harris, 1995). The long-run vector, Π , is the primary vector of interest and is defined as a multiple of two $(n \times r)$ vectors, α and β , where n is the number of cointegrating equations, r is the number of cointegrating vectors, and Γ is the rank of Π . Hence $\Pi = \alpha\beta'$ where α is the loading matrix, which denotes the speed of adjustment from disequilibrium, and β' is the matrix of long-run coefficients, which ensures that y_t converges to a long-run steady state.

In this study, the macroeconomic impacts of the capital inflows are assessed using the following model based on Berument and Dincer (2004):

$$Y_t = f(CF_t, Log_Res_t, Tbill_t, R_USD_t, Log_RGDP_t, Log_CPI_t)' \quad (3)$$

where CF are the capital inflows (FDI, portfolio, and other inflows), Log_Res is the logarithm of the central bank reserves, $Tbill$ is the 3-month Treasury bill rate, R_USD is the nominal Rand/U.S. dollar exchange rate, Log_RGDP is the logarithm of real GDP, and Log_CPI is the logarithm of the CPI index.

Thereafter, the impacts of the capital inflows on the three vectors of transmission factors are assessed. Ideally one would want to model the interactions between all of the variables in a single VECM system. However, due to the number of variables this is not possible and thus this study uses the intermediate approach of Christiano *et al.* (1996), Jansen (2003), and Kim and Yang (2009). Hence, for each X , the impulse response analysis is undertaken using three separate VECM models that include the vector of transmission variables and a common set of macroeconomic control variables. The three models examine the effects on domestic credit extension (X_{credit}), asset prices (X_{assets}), and household consumption expenditure ($X_{households}$) as represented by the following equations:

$$Y_t = f(Log_RGDP_t, Log_CPI_t, CF_t, Tbill_t, X_{credit,t})' \quad (4)$$

$$Y_t = f(\text{Log_RGDP}_t, \text{Log_CPI}_t, CF_t, Tbill_t, X_{assets,t})' \quad (5)$$

$$Y_t = f(\text{Log_RGDP}_t, \text{Log_CPI}_t, X_{households,t}, CF_t, Tbill_t)' \quad (6)$$

5.5 DATA DESCRIPTION

All of the data included in this study is on a quarterly basis and covers the period from the second quarter of 1995 to the end of 2007. The disaggregated capital inflows (liabilities) include FDI (*DIL*), portfolio investment (*PIL*), and other investment (*OIL*). All of the capital flow data was obtained from the South African Reserve Bank and is measured in millions of Rands. In addition, the empirical models also include (0,1) dummy variables to take account of the capital flow effects associated with the Anglo American-De Beers unwinding in the second quarter of 2001, as well as the heightened volatility among the capital flow components in 2005 and 2006.⁴¹

The macroeconomic and transmission variables have been selected in accordance with the literature of Berument and Dincer (2004), Christiano *et al.* (1996), Jansen (2003), and Kim and Yang (2009). The macroeconomic variables consist of the logarithm of the central bank's total gold and other foreign reserves (*Log_Res*), the 3-month Treasury bill interest rate (*Tbill*), the nominal Rand/U.S. dollar exchange rate (*R_USD*), the logarithm of seasonally adjusted real GDP (*Log_RGDP*), and the logarithm of the CPI index (*Log_CPI*). All of the macroeconomic data was obtained from the South African Reserve Bank.

The variables included in the vector of credit extension (X_{credit}) consist of the logarithm of total credit extended to the private sector by all monetary institutions (*Log_Credit*), the logarithm of new mortgage loans and re-advances granted for residential dwellings and flats by financial institutions (*Log_Mort*), and the logarithm of the total value of credit card purchases processed by all institutions (*Log_CCard*). The second vector of transmission variables relate to asset prices (X_{assets}) and consist of the logarithm of the Bond Exchange of South Africa's All-Bond Index (*Log_ALBI*), the logarithm of the Johannesburg All-Share Index (*Log_ALSI*), and the logarithm of the Standard Bank house price index (*Log_House*). The final vector of transmission variables relate to household consumption expenditure ($X_{households}$) and includes the logarithm of real seasonally adjusted final consumption expenditure by households on durable goods (*Log_HCDG*), semi-durable goods

⁴¹ See Appendix 5-A for a list of the outliers.

(Log_HCSDG), and non-durable goods (Log_HCNDG). All of the domestic credit extension (X_{credit}) and household consumption expenditure ($X_{\text{households}}$) data was obtained from the South African Reserve Bank, while the asset price (X_{assets}) data was obtained from Inet-Bridge.

5.6 EMPIRICAL RESULTS

Prior to formulating the VECM models, the stationarity and cointegrating properties of the data must first be examined so as to avoid misspecification. Hence in the first step of the analysis, augmented Dickey-Fuller (1979, 1981) (ADF) and Phillips-Perron (1988) (PP) unit root tests are used to assess the stationarity of each series.⁴² The results of the unit root tests are presented in Table 5-1 below and show that FDI and PIL are $I(0)$ stationary while most of the other variables are $I(1)$ stationary. In the case of OIL , Log_HCDG and Log_HCNDG , the unit root tests produce inconclusive results. Thus in order to resolve these disparities, a KPSS stationarity test (Kwiatkowski *et al.*, 1992) was undertaken and the results show that all three of the variables are $I(1)$ stationary. Hence, all of the variables in the VECM models are included in first-differences, except for FDI and PIL , which are both included in levels.

⁴² See section 2.4 for a technical description of the unit root and stationarity tests.

Table 5-1: Unit Root Test Results

Variable	ADF Test		PP Test	
	I(0)	I(1)	I(0)	I(1)
<i>Capital Inflows:</i>				
DIL	-6.191 ***	-7.809 ***	-6.151 ***	-23.492 ***
PIL	-4.594 ***	-5.943 ***	-4.560 ***	-26.852 ***
OIL	-0.658	-8.197 ***	-4.932 ***	-15.000 ***
<i>Macroeconomic Factors:</i>				
Log_CPI	-1.004	-3.934 ***	-0.980	-3.527 ***
Log_M2	0.827	-5.639 ***	0.829	-6.071 ***
Log_Res	-0.576	-4.401 ***	-0.696	-3.896 ***
Log_RGDP	1.332	-2.952 **	2.513	-2.952 **
R_USD	-1.976	-4.845 ***	-1.841	-4.888 ***
Tbill	-1.806	-5.699 ***	-1.569	-5.583 ***
<i>Credit Extension Factors:</i>				
Log_Credit	1.262	-5.016 ***	1.764	-4.986 ***
Log_Mort	0.079	-5.259 ***	0.234	-5.264 ***
Log_CCard	-1.080	-9.431 ***	-1.007	-9.533 ***
<i>Asset Price Factors:</i>				
Log_ALBI	-1.166	-5.078 ***	-1.746	-6.808 ***
Log_ALSI	1.070	-6.287 ***	1.160	-6.287 ***
Log_House	0.573	-8.159 ***	0.640	-8.072 ***
<i>Household Consumption Factors:</i>				
Log_HCDG	-0.022	-2.842 *	0.498	-4.595 ***
Log_HCSDG	2.719	-4.120 ***	2.277	-4.155 ***
Log_HCNDG	0.507	-1.715	1.952	-4.264 ***

The ADF and PP tests both include a constant. The ADF unit root test include a maximum of 4 lags chosen on the basis of the Akaike Information Criterion (AIC). ***, **, and * represent significance at the 1%, 5%, and 10% levels respectively.

After examining the stationarity of the data, the next step of the analysis is to test for cointegration among the I(1) variables. This is achieved using the Johansen (1995) maximum likelihood approach based on a 1% significance level. The results presented Table 5-2 show that the macroeconomic variables in equation (3) have one cointegrating relationship, while the variables in the transmission models (4) – (6) have two cointegrating relationships each.

Table 5-2: Cointegration Test Results

Trace Test					Max Eigenvalue Test			
No. of CE(s)	λ	Trace	5% C.V.	Prob.	No. of CE(s)	Max-Eigen	5% C.V.	Prob.
<i>Macroeconomic [1]</i>								
None *	0.654	120.900	95.754	0.000	None *	52.014	40.078	0.002
At most 1	0.480	68.886	69.819	0.059	At most 1	32.008	33.877	0.082
At most 2	0.350	36.878	47.856	0.353	At most 2	21.123	27.584	0.269
At most 3	0.231	15.754	29.797	0.729	At most 3	12.841	21.132	0.467
At most 4	0.056	2.914	15.495	0.971	At most 4	2.808	14.265	0.959
At most 5	0.002	0.106	3.841	0.745	At most 5	0.106	3.841	0.745
<i>Credit Extension [2]:</i>								
None *	0.740	181.426	125.615	0.000	None *	65.932	46.231	0.000
At most 1 *	0.598	115.493	95.754	0.001	At most 1 *	44.656	40.078	0.014
At most 2 *	0.460	70.837	69.819	0.041	At most 2	30.169	33.877	0.130
At most 3	0.335	40.669	47.856	0.199	At most 3	19.956	27.584	0.344
At most 4	0.242	20.713	29.797	0.376	At most 4	13.604	21.132	0.398
At most 5	0.131	7.109	15.495	0.565	At most 5	6.880	14.265	0.504
At most 6	0.005	0.230	3.841	0.632	At most 6	0.230	3.841	0.632
<i>Asset Prices [2]:</i>								
None *	0.691	175.865	125.615	0.000	None *	57.608	46.231	0.002
At most 1 *	0.596	118.257	95.754	0.001	At most 1 *	44.364	40.078	0.016
At most 2 *	0.448	73.893	69.819	0.023	At most 2	29.092	33.877	0.168
At most 3	0.336	44.802	47.856	0.094	At most 3	20.096	27.584	0.335
At most 4	0.242	24.706	29.797	0.172	At most 4	13.600	21.132	0.399
At most 5	0.203	11.106	15.495	0.205	At most 5	11.105	14.265	0.149
At most 6	0.000	0.000	3.841	0.990	At most 6	0.000	3.841	0.990
<i>Household Consumption [2]:</i>								
None *	0.710	192.471	125.615	0.000	None *	60.736	46.231	0.001
At most 1 *	0.594	131.735	95.754	0.000	At most 1 *	44.145	40.078	0.017
At most 2 *	0.502	87.591	69.819	0.001	At most 2 *	34.155	33.877	0.046
At most 3 *	0.408	53.436	47.856	0.014	At most 3	25.650	27.584	0.087
At most 4	0.339	27.786	29.797	0.084	At most 4	20.275	21.132	0.066
At most 5	0.141	7.511	15.495	0.519	At most 5	7.442	14.265	0.438
At most 6	0.001	0.069	3.841	0.793	At most 6	0.069	3.841	0.793

Lags interval (in first differences): 1 to 1. Number of cointegrating relationships indicated in square brackets relate to 1% significance based on the critical values of MacKinnon-Haug-Michelis (1999).

The information provided by the stationarity and cointegration tests can be used to generate the VECM models from equations (3) – (6). The lag order selected for the VECM estimation has been made on the basis of the Schwartz Information Criterion (SIC), which finds that one lag is sufficient for all of the models. Thereafter, the stability of the VECM's is assessed using standard diagnostic

tests. The plots of the inverse roots of AR characteristic polynomials presented in Figure 5-2 indicate that the SVAR models are stable. In addition, the LM-Test statistics presented in Table 5-3 show that there is no significant residual serial correlation. Thus, having determined that the empirical models are correctly specified, the final part of the empirical approach is to conduct impulse response analysis in order to assess the effects of the capital inflows on South Africa's macroeconomy and on the transmission mechanisms of credit extension, asset prices, and household consumption expenditure.

Figure 5-2: Inverse Roots of AR Characteristic Polynomials

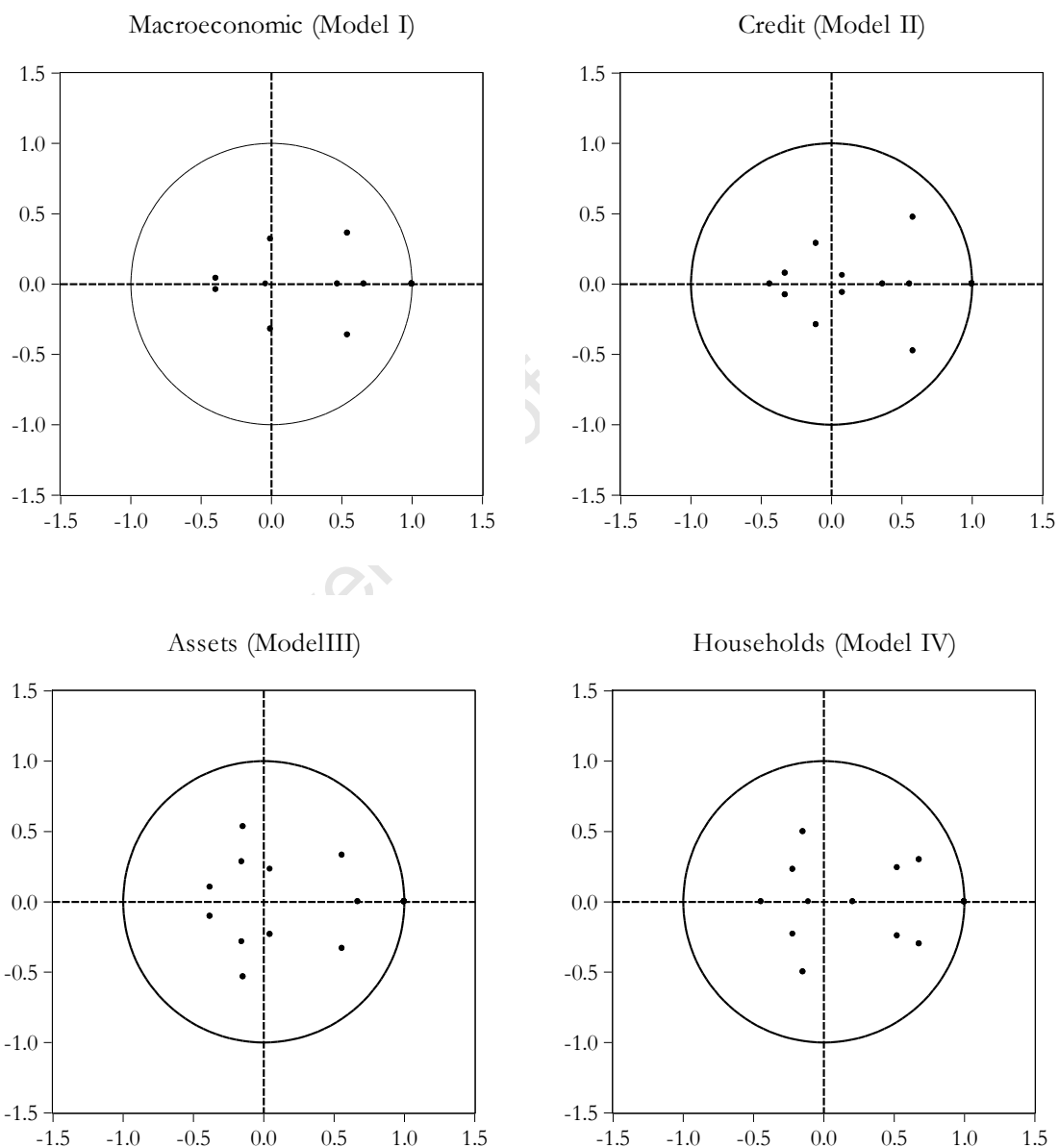


Table 5-3: Residual Serial Correlation LM Tests

Lags	Model I	Model II	Model III	Model IV
	Macroeconomic	Credit	Assets	Households
2	53.850 (0.81)	62.139 (0.94)	89.824 (0.24)	93.203 (0.17)
4	56.016 (0.75)	67.008 (0.87)	79.565 (0.52)	67.069 (0.87)
6	49.744 (0.90)	82.167 (0.44)	85.104 (0.36)	98.032 (0.10)
8	52.307 (0.85)	79.733 (0.52)	82.090 (0.45)	95.192 (0.13)
10	65.986 (0.41)	96.856 (0.11)	84.807 (0.36)	70.715 (0.79)
12	61.67 (0.56)	89.30 (0.25)	83.49 (0.40)	92.82 (0.17)

Probabilities from chi-square statistics with 64 degrees of freedom are provided in parentheses.

5.6.1 Macroeconomic Effects

The results of the macroeconomic impulse responses are presented in Table 5-4 below and show that although the different capital flow components have relatively varied impacts on the South African economy, the impacts of FDI and portfolio inflow shocks tend to be more similar compared to the effects of other inflow shocks.

If left unchecked, capital inflows can result in an appreciation of the exchange rate. Hence, in a floating exchange rate environment, the central bank may choose to intervene by buying foreign currency and thus increasing central bank reserves. The results suggest that sterilisation occurs upon impact of a portfolio and FDI inflow but not in the case of other inflows. Upon impact, portfolio inflows lead to a 15 cent appreciation of the exchange rate, while FDI leads to about a 4 cent appreciation. However, the central bank then intervenes with a 0.84% increase in reserves in the short-run, which rises to 2.87% for portfolio inflows and declines to 0.49% for FDI in the long-run. Other inflows in contrast, are associated with a short-run depreciation of the exchange rate of around 16 cents, levelling off at 7 cents in the long-run, while central bank reserves decline by around 1.23%. Hence, these results suggest that the central bank uses a strategy of on-going sterilisation for portfolio inflows and targeted sterilisation for FDI. Over time, this implies that the

exchange rate is allowed to appreciate by 4 cents following a FDI shock and by 15 cents following a portfolio shock.

In theory, the heightened sterilisation and currency appreciation should result in a decline in interest rates when there is a capital inflow shock, and the results show that this is the case for FDI and portfolio inflows, but not for other inflows. However, the results further show that the downward pressure is greater following a portfolio shock than an FDI shock. In the case of portfolio shocks, the Tbill rate declines by 31 basis points upon impact, falling 54 basis points after two quarters, before gradually levelling off 40 basis points below in the long-run. FDI shocks are associated with an average 23 basis point decline over the first four quarters following a shock, levelling off at around 15 basis points below pre-shock levels in the long-run. In contrast, a shock to other inflows is associated with a 12 basis point increase upon impact, which then rises to around 53 basis points above pre-shock levels in the long-run. Hence, considered in conjunction with the impulse responses of central bank reserves, these results suggest that interest rates rather than reserves are used by monetary authorities to counteract other inflow shocks.

The impact of the inflows on the real factors show that FDI and portfolio inflows have a positive effect on GDP, being associated with an increase of around 0.24% and 0.16% respectively after six quarters, while other inflows have a negligible impact. The finding that FDI shocks have the most significant effect on GDP despite only accounting for 22% of South Africa's total capital inflows, suggests that in accordance with the literature,⁴³ increased FDI inflows could have a disproportionately beneficial impact on the country via spillover effects (De Mello, 1997; Borensztein *et al.*, 1998). The effects on prices are shown to be a -0.07% decline following a FDI shock and a -0.21% decline following a portfolio shock in the first three quarters, but a 0.20% increase following other inflow shocks. Hence FDI and portfolio inflows are associated with lower prices while other inflows are associated with higher prices.

Thus in summary, the results show that a shock to FDI and portfolio inflows results in an increase in GDP, leads to an appreciation of the exchange rate, decreases interest rates and prices, and are sterilised by the central bank. Other inflow shocks in contrast, do not have a significant long-run impact on GDP, lead to a depreciation of the exchange rate, increases interest rates and prices, and are not significantly sterilised by the central bank.

⁴³ For example see Lim (2001) and Hansen and Rand (2006).

Table 5-4: Macroeconomic Impulse Responses (Responses to Cholesky One S.D. Innovations)

Period	Log_Res			R_USD			Tbill			Log_RGDP			Log_CPI		
	DIL	PIL	OIL	DIL	PIL	OIL	DIL	PIL	OIL	DIL	PIL	OIL	DIL	PIL	OIL
1	0.84%	0.84%	-0.59%	-0.04	-0.15	0.08	-0.24	-0.31	0.12	0.08%	0.03%	0.00%	-0.03%	-0.10%	0.05%
2	0.94%	2.50%	-0.38%	-0.06	-0.05	0.16	-0.25	-0.54	0.36	0.13%	0.08%	0.02%	-0.05%	-0.21%	0.15%
3	1.12%	2.99%	-0.72%	-0.02	0.00	0.14	-0.23	-0.50	0.43	0.18%	0.11%	0.02%	-0.07%	-0.21%	0.20%
4	1.03%	3.20%	-0.84%	-0.03	0.02	0.14	-0.20	-0.50	0.52	0.21%	0.14%	0.04%	-0.05%	-0.20%	0.23%
5	0.84%	3.17%	-1.10%	-0.06	0.02	0.10	-0.15	-0.43	0.55	0.22%	0.15%	0.04%	-0.04%	-0.18%	0.25%
6	0.66%	3.04%	-1.22%	-0.09	0.00	0.08	-0.13	-0.40	0.57	0.23%	0.16%	0.04%	-0.03%	-0.16%	0.26%
7	0.55%	2.94%	-1.28%	-0.11	-0.02	0.06	-0.13	-0.39	0.56	0.24%	0.16%	0.03%	-0.03%	-0.16%	0.25%
8	0.50%	2.87%	-1.28%	-0.13	-0.04	0.06	-0.13	-0.39	0.55	0.24%	0.16%	0.03%	-0.04%	-0.16%	0.25%
9	0.48%	2.85%	-1.26%	-0.14	-0.05	0.06	-0.14	-0.39	0.54	0.24%	0.16%	0.03%	-0.04%	-0.16%	0.24%
10	0.48%	2.85%	-1.24%	-0.14	-0.05	0.06	-0.15	-0.40	0.53	0.24%	0.16%	0.03%	-0.05%	-0.17%	0.24%
11	0.49%	2.86%	-1.23%	-0.14	-0.05	0.07	-0.15	-0.40	0.53	0.24%	0.16%	0.03%	-0.05%	-0.17%	0.24%
12	0.49%	2.87%	-1.22%	-0.14	-0.05	0.07	-0.15	-0.41	0.53	0.24%	0.16%	0.04%	-0.05%	-0.17%	0.24%
13	0.49%	2.87%	-1.22%	-0.14	-0.05	0.07	-0.15	-0.41	0.53	0.25%	0.16%	0.04%	-0.05%	-0.17%	0.24%
14	0.49%	2.87%	-1.22%	-0.14	-0.05	0.07	-0.15	-0.41	0.53	0.25%	0.16%	0.04%	-0.05%	-0.17%	0.24%
15	0.49%	2.87%	-1.23%	-0.14	-0.05	0.07	-0.15	-0.41	0.53	0.25%	0.16%	0.04%	-0.05%	-0.17%	0.24%
16	0.49%	2.87%	-1.23%	-0.14	-0.05	0.07	-0.15	-0.41	0.53	0.25%	0.16%	0.04%	-0.05%	-0.17%	0.24%

5.6.2 Credit Extension

The lower interest rates associated with FDI and portfolio inflows can be expected to stimulate an increased demand for credit, while the heightened interest rates associated with other inflows could tend to lessen the demand for credit. The impulse responses of the credit extension factors presented in Table 5-5 below support these expectations in the case of portfolio inflows and other inflows, but not in the case of FDI.

Table 5-5: Credit Extension Impulse Responses (Responses to Cholesky One S.D. Innovations)

Period	Log_Credit			Log_Mort			Log_CCard		
	DIL	PIL	OIL	DIL	PIL	OIL	DIL	PIL	OIL
1	-0.30%	0.18%	-0.02%	-0.15%	0.85%	-0.01%	0.23%	0.18%	-0.60%
2	-0.49%	0.33%	-0.03%	-0.24%	1.45%	0.53%	0.10%	0.07%	-0.74%
3	-0.48%	0.42%	-0.31%	-0.06%	0.50%	2.16%	0.24%	0.04%	-0.80%
4	-0.45%	0.48%	-0.40%	-0.14%	0.36%	3.34%	0.23%	0.04%	-0.70%
5	-0.39%	0.45%	-0.41%	-0.36%	0.28%	3.74%	0.25%	-0.02%	-0.68%
6	-0.35%	0.42%	-0.33%	-0.55%	0.36%	3.75%	0.23%	-0.02%	-0.61%
7	-0.34%	0.38%	-0.25%	-0.67%	0.50%	3.51%	0.22%	-0.03%	-0.61%
8	-0.35%	0.36%	-0.19%	-0.69%	0.63%	3.23%	0.20%	-0.02%	-0.62%
9	-0.37%	0.36%	-0.16%	-0.66%	0.69%	3.05%	0.20%	-0.01%	-0.65%
10	-0.38%	0.37%	-0.17%	-0.60%	0.69%	2.98%	0.20%	0.00%	-0.66%
11	-0.39%	0.38%	-0.19%	-0.56%	0.66%	3.02%	0.20%	0.00%	-0.67%
12	-0.39%	0.39%	-0.21%	-0.54%	0.62%	3.10%	0.21%	0.00%	-0.68%
13	-0.39%	0.39%	-0.23%	-0.54%	0.59%	3.16%	0.21%	0.00%	-0.67%
14	-0.38%	0.39%	-0.23%	-0.55%	0.58%	3.20%	0.21%	-0.01%	-0.67%
15	-0.38%	0.39%	-0.22%	-0.57%	0.59%	3.20%	0.21%	-0.01%	-0.66%
16	-0.38%	0.38%	-0.22%	-0.58%	0.60%	3.19%	0.21%	-0.01%	-0.66%

Portfolio inflows are associated with an immediate 0.18% increase in credit extension, rising to around 0.39% in the long-run, while other inflows have a negative effect, especially from four quarters onwards, with credit extension levelling off at around -0.22% below initial impact in the long-run. FDI in contrast, is found to have a negative rather than a positive effect on credit extension even though FDI is associated with lower interest rates. In the short-run, a FDI shock is associated with an immediate 0.30% decline in credit extension, levelling off at around 0.38% below initial impact in the long-run. This finding suggests that FDI investment in South Africa is leveraged

abroad rather than through domestic credit markets, possibly as a result of the oligopolistic structure and high fees associated with the country's banking sector (Okeahalam, 2001).

Considering the results of the impulse responses on mortgage extensions, portfolio inflows have a positive effect that peaks at 1.45% two quarters after impact, and then levels off at around 0.60% in the long-run. The impact of other inflow shocks is even more significant, leading to an increased demand for mortgage extensions that steadily rises to around 3.75% at six quarters after impact before levelling off at around 3.20% in the long-run. In contrast, FDI has a negative impact on mortgage extensions, declining from -0.15% upon impact, to around -0.55% from six quarters onwards. Thus, these results indicate that the 'hot' capital flows have a positive effect on mortgage extensions, while FDI has a negative effect, supporting the literature that asserts that short-term capital flows are associated with property booms.

Short-term credit card expenditure can be expected to increase during periods of heightened economic activity, and thus the Tbill and real GDP impulse responses suggest that FDI and portfolio inflows should have a greater effect on credit card expenditure than other inflows. The results of the credit card impulse responses indicate that the impact tends to accord with these prior expectations in the short-run with an FDI shock being associated with an immediate 0.23% increase in credit card extensions and a portfolio inflow shock being associated with a 0.18% increase. In contrast, an other inflow shock is associated with a negative 0.70% within the first four quarters after a shock, levelling off at around a negative 0.67% thereafter. In the long-run, only FDI shocks have a positive impact, levelling off at 0.21%. Hence, the positive impact of a FDI shock on credit card debt compared to the negative impact on mortgage extensions suggests that although FDI is typically considered to be long-term investment, the heightened credit transmission arising from FDI inflows to South Africa tends to be short-term. This disparity between the intrinsic nature and impact of the country's FDI inflows may reflect the country's well developed financial markets coupled with on-going risk aversion, which shifts the focus of international investors from long-term to short-term. In addition, the positive effect of an other inflow shock on mortgage extensions coupled with the negative effect on credit card expenditure suggests that South Africans tend to use property-related access bonds for short-term discretionary spending to a greater extent than credit card facilities.

Thus, these results show that only portfolio inflow shocks have a positive impact on all of the credit channels, while FDI shocks have a positive effect on credit card expenditure, and other inflow shocks have a positive impact on mortgage extensions.

5.6.3 Asset Prices

The impacts of the capital inflow shocks on asset prices are presented in Table 5-6 below and show that overall; portfolio inflow shocks have the most significant effect on share prices, while other inflow shocks have the most significant effect on bond and house prices.

Table 5-6: Asset Prices Impulse Responses (Responses to Cholesky One S.D. Innovations)

Period	Log_ALBI			Log_ALSI			Log_House		
	DIL	PIL	OIL	DIL	PIL	OIL	DIL	PIL	OIL
1	0.11%	0.00%	-0.47%	-0.05%	1.31%	0.43%	-0.52%	0.64%	-0.62%
2	0.22%	-0.44%	-0.63%	-0.15%	0.85%	0.64%	-0.49%	-0.01%	-0.75%
3	0.17%	-0.28%	-0.49%	-0.02%	0.80%	-0.28%	-0.40%	0.28%	-0.88%
4	0.09%	-0.27%	-0.32%	0.01%	0.83%	-0.02%	-0.41%	0.34%	-0.66%
5	0.07%	-0.32%	-0.36%	0.04%	0.89%	-0.09%	-0.44%	0.34%	-0.76%
6	0.07%	-0.34%	-0.36%	0.02%	0.88%	-0.10%	-0.44%	0.31%	-0.71%
7	0.08%	-0.34%	-0.37%	0.02%	0.87%	-0.10%	-0.44%	0.34%	-0.69%
8	0.08%	-0.35%	-0.40%	0.01%	0.88%	-0.08%	-0.45%	0.34%	-0.67%
9	0.09%	-0.36%	-0.42%	0.01%	0.88%	-0.08%	-0.45%	0.33%	-0.68%
10	0.10%	-0.36%	-0.43%	0.00%	0.87%	-0.08%	-0.45%	0.33%	-0.67%
11	0.10%	-0.36%	-0.43%	0.01%	0.87%	-0.08%	-0.45%	0.33%	-0.67%
12	0.10%	-0.36%	-0.43%	0.01%	0.87%	-0.08%	-0.45%	0.33%	-0.68%
13	0.10%	-0.36%	-0.43%	0.01%	0.87%	-0.09%	-0.45%	0.33%	-0.68%
14	0.10%	-0.36%	-0.43%	0.01%	0.87%	-0.09%	-0.45%	0.33%	-0.68%
15	0.10%	-0.36%	-0.43%	0.01%	0.87%	-0.09%	-0.45%	0.33%	-0.68%
16	0.10%	-0.36%	-0.43%	0.01%	0.87%	-0.09%	-0.45%	0.33%	-0.68%

With regard to the ALBI, the impact of a portfolio inflow shock is not felt immediately but rather takes effect most significantly two quarters later, leading to a -0.44% decline in the ALBI. Other inflow shocks also have a negative effect, but unlike a portfolio shock, the impact is felt immediately with a -0.47% effect, worsening to -0.63% after two quarters, before levelling off at around -0.43% in the long-run. FDI in contrast has a positive 0.11% effect on the ALBI, which peaks at 0.17% after two quarters and then reaches an equilibrium of around 0.10% thereafter. Hence, these results indicate that only FDI shocks have a positive effect on the ALBI.

The impacts of the inflows on the ALSI are greater than on the ALBI, especially for portfolio inflow shocks, which have a 1.31% positive effect on impact and a 0.87% long-run effect. Other inflow shocks have a 0.43% effect upon impact, peaking at 0.64% two quarters after impact before

turning negative from three quarters onwards, levelling off at around -0.10%. FDI in contrast, has a short-run negative effect on the ALSI, resulting in a decline of -0.05% upon impact, worsening to -0.15% after two quarters, before stabilising at near zero thereafter. Considering that the bulk of South Africa's capital inflows are in the form of portfolio investment, the finding that these inflows have more of an impact on the ALSI than on the ALBI suggests that most of the country's capital inflows enter via the stock market rather than the bond market. Hence, this further indicates that international investors tend to focus on expected stock returns rather than on interest rates when allocating capital to South Africa.

The impacts of the capital inflow shocks on house prices are once again divergent for portfolio inflows compared to FDI and other inflows. Portfolio shocks have a 0.64% effect on impact, which reaches an equilibrium position of 0.33%. In contrast, FDI and other inflow shocks are associated with a -0.52% and -0.88% effect respectively. The impulse response results of FDI and portfolio investment on mortgage extensions accord with the effects on house prices, whereby an FDI shock has a marginally negative effect on mortgage extensions and house prices, while a portfolio shock has a positive effect. However, the impulse responses of other inflow shocks are not consistent, since an other inflow shock is associated with a positive effect on mortgage extensions but a negative effect on house prices.

Hence, these results imply that the impact on asset prices is most significant following a portfolio inflow shock. Considered in combination with previous findings, this result suggests that in accordance with Benjamin *et al.* (2004), Case *et al.* (2005), and Haurin and Rosenthal (2005), lower interest rates and portfolio inflow-driven credit demand tends to stimulate equity prices and trigger higher house prices, which can then be used to obtain home equity loans or second mortgages in order to reduce short-term debt or increase consumption, thus prolonging the boom so long as interest rates remain level and the inflows continue.

5.6.4 Household Consumption

The household consumption expenditure impulse responses are presented in Table 5-7 overleaf and show that overall, other inflow shocks have the most significant effect on household consumption.

Table 5-7: Household Consumption Impulse responses (Responses to Cholesky One S.D. Innovations)

Period	Log_HCDG			Log_HCSDG			Log_HCNDG		
	DIL	PIL	OIL	DIL	PIL	OIL	DIL	PIL	OIL
1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2	-0.05%	0.04%	0.06%	-0.01%	-0.05%	0.07%	0.01%	0.00%	0.05%
3	0.05%	0.05%	-0.06%	-0.03%	-0.04%	0.00%	0.00%	0.01%	0.04%
4	0.02%	-0.06%	-0.14%	-0.05%	-0.07%	-0.04%	0.00%	0.00%	0.04%
5	0.00%	-0.14%	-0.21%	-0.06%	-0.07%	-0.07%	0.00%	-0.01%	0.02%
6	0.01%	-0.17%	-0.26%	-0.06%	-0.07%	-0.10%	0.00%	-0.01%	0.01%
7	0.00%	-0.19%	-0.30%	-0.06%	-0.07%	-0.11%	-0.01%	-0.02%	0.00%
8	-0.01%	-0.19%	-0.31%	-0.06%	-0.07%	-0.12%	-0.01%	-0.02%	-0.01%
9	-0.01%	-0.18%	-0.32%	-0.06%	-0.07%	-0.12%	-0.01%	-0.03%	-0.01%
10	0.00%	-0.17%	-0.31%	-0.06%	-0.06%	-0.12%	-0.01%	-0.03%	-0.01%
11	0.00%	-0.16%	-0.30%	-0.06%	-0.06%	-0.11%	-0.01%	-0.03%	-0.02%
12	0.00%	-0.16%	-0.29%	-0.06%	-0.06%	-0.11%	-0.01%	-0.02%	-0.01%
13	0.00%	-0.15%	-0.29%	-0.06%	-0.06%	-0.11%	-0.01%	-0.02%	-0.01%
14	0.00%	-0.15%	-0.28%	-0.06%	-0.06%	-0.11%	-0.01%	-0.02%	-0.01%
15	0.00%	-0.15%	-0.28%	-0.06%	-0.06%	-0.11%	-0.01%	-0.02%	-0.01%
16	0.00%	-0.15%	-0.28%	-0.06%	-0.06%	-0.11%	-0.01%	-0.02%	-0.01%

The ‘hot’ inflow shocks are shown to have a marginally positive impact on the consumption of durables in the short-run with the impact peaking at 0.05% after three quarters following a portfolio shock, and at 0.06% after two quarters following an other inflow shock. FDI shocks in contrast, has a short-run negative impact of -0.05% after two quarters, but from five quarters on, the effects diminishes to near-zero. In addition, the effects of portfolio and other inflow shocks also turn significantly negative in the long-run, levelling off at around -0.15% and -0.28% respectively. Thus, shocks to the ‘hot’ inflows have short-run beneficial effects on household consumption of durables but long-run negative effects, while FDI has a short-run negative effect and a negligible long-run effect.

The impacts of the capital inflow shocks on semi-durable consumption expenditure by households are negative for FDI and portfolio inflows over both the short-run and long-run, but positive following an other inflow shock, which has a 0.07% effect after two quarters. However, the effects of an other inflow shock turn negative from three quarters onwards and the long-run effects are then more significantly negative than following shocks to FDI or portfolio inflows, with the effects of other inflows levelling off at -0.11% compared to -0.06% for FDI and portfolio inflows.

Considering the impact on non-durables, overall, FDI shocks have the least significant long-run effect, hovering around -0.01%, while the effect of a portfolio shock peaks at 0.01% after three quarters and then declines to -0.02% in the long-run. Other inflow shocks in contrast, have the most significant positive short-run effect on semi-durable consumption, peaking at 0.05% after two quarters, before gradually subsiding to -0.01% from eight quarters onwards. Thus all of the capital flows have a marginally positive short-run effect on non-durables that peaks at two to three quarters after impact.

Hence, these results suggest that in the short-run, only an other inflow shock has a positive effect on all of the household consumption components, while portfolio shocks have a marginally positive effect on household consumption of durable and non-durable goods. In the long-run however, all of the capital inflows have a negative effect on household consumption. Thus considered in combination with previous results, the finding that only an other inflow shock has a positive effect on household consumption expenditure suggests that an other inflow shock is associated with home-equity mortgages rather than with investment property mortgages and thus the effect on house prices is negative while the effect on household consumption is positive.

5.7 CONCLUSION

This study used VECM models with impulse response analysis to examine the effects of capital inflows on South Africa's macroeconomy and on the transmission mechanisms of credit extension, asset prices, and household consumption expenditure.

With regard to the macroeconomic impacts of the capital inflows, the results show that although the different capital flow components have relatively varied impacts on the South African economy, the impacts of FDI and portfolio inflow shocks tend to be more similar compared to the effects of other inflow shocks. FDI and portfolio inflows are found to increase GDP, lead to an appreciation of the exchange rate, and decrease interest rates and prices. Other inflows in contrast, do not have a significant long-run impact on GDP, lead to a depreciation of the exchange rate, and increase interest rates and prices. In addition, it is found that the central bank uses a strategy of on-going sterilisation for portfolio inflows and targeted sterilisation for FDI, but does not sterilise other inflows.

With regard to the impacts of the capital inflows on the credit transmission mechanisms, the results show that portfolio inflows have a positive impact on all of the credit channels of total credit, mortgages and credit card extension, while FDI has a positive effect on credit card expenditure, and

other inflows have a positive impact on mortgage extensions. Thus, these results indicate that the 'hot' capital flows have a positive effect on mortgage extensions, while FDI has a negative effect, thus supporting the literature that asserts that short-term capital flows are associated with property booms. In addition, the positive effect of other inflows on mortgage extensions, coupled with the negative effect on credit card expenditure, suggests that South Africans tend to use property-related access bonds for short-term discretionary spending to a greater extent than credit card facilities.

The results of the asset price impulse responses show that only FDI shocks have a positive effect on the ALBI, while portfolio inflow shocks significantly affect the ALSI. Other inflow shocks have a negative effect on the ALBI and a short-run positive effect on the ALSI. With regard to house prices, it is found that portfolio inflow shocks have a positive effect, while FDI and other inflow shocks have negative effects. Thus, asset prices are found to be most significantly impacted by portfolio inflows.

The results of the household consumption expenditure impulse responses show that the 'hot' inflows have a marginally positive impact on the consumption of durables in the short-run, but long-run negative effects; while FDI shocks have a short-run negative effect and a negligible long-run effect. The impacts of the capital inflows on semi-durable consumption expenditure by households are negative for FDI and portfolio inflow shocks over both the short-run and long-run, but positive for other inflow shocks. Lastly, all of the capital flows are found to have a marginally positive short-run but negative long-run effect on non-durables. Hence, these results suggest that in the long-run, all of the capital inflows have a negative effect on household consumption. In the short-run however, other inflow shocks have the most significant positive effect. Thus, other inflows are associated with home-equity mortgages rather than with investment property mortgages, and thus the effect on house prices is negative while the effect on household consumption is positive.

Hence, these results show that although the capital inflow components have varied impacts on South Africa's macroeconomy and transmission mechanisms, policy-makers should encourage a greater proportion of FDI, as well as promote stability among the short-term inflows so as to mitigate boom-bust cycles.

APPENDICES

Appendix 5-A: Capital Flow Outliers

DIL	PIL	OIL
2001:Q2	2001:Q2	-
-	-	2005:Q1
2005:Q3	-	-
2006:Q4	-	-

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CHAPTER 6

THE EFFECTS OF PORTFOLIO INFLOWS ON THE NOMINAL RAND/U.S. DOLLAR EXCHANGE RATE

6.1 INTRODUCTION

The currency crises among emerging countries over the last two decades have demonstrated that shifts in short-run factors such as capital flows, can have a significant impact on exchange rates (Steinheer, 2000; Hau and Rey, 2006). However, traditional exchange rate models such as purchase power parity (Cassel, 1918), Harrod-Balassa-Samuelson (Harrod, 1933; Balassa, 1964; Samuelson, 1964), and balance-of-payments (Gandolfo, 1979) tend to focus on the long-run equilibriums of contemporaneous fundamentals rather than on determinants of short-run fluctuations. In addition, traditional exchange rate models have been found in practice to produce poor in-sample results when applied to floating exchange rates (Meese and Rogoff, 1983a and 1983b; Flood and Rose, 1995; De Jong, 1997; Cushman, 2000).

LiPuma and Koelble (2009) note that it is possible that the traditional variables of inflation, current account balances, GDP and interest rate differentials increasingly fail to account for the heightened fluctuations of exchange rates because traditional models do not take the post-liberalised global environment into account. Two recent variants of the traditional approach that have attempted to take bond market movements into account, are the monetary and portfolio balance approaches. According to the monetary approach, the exchange rate is determined by the relative supply of, and demand for, money. Thus an increase in the domestic money supply, or a rise in domestic interest rates, will depreciate the exchange rate, while an increase in GDP will cause the exchange rate to appreciate. In the portfolio balance approach, the exchange rate is the adjustment mechanism that keeps the domestic and foreign asset markets in equilibrium. Thus the primary difference between these two approaches is that the monetary approach assumes perfect substitutability between domestic and foreign bonds, and consequently supply is irrelevant, while the portfolio approaches assumes imperfect substitutability, and thus supply matters (Gandolfo, 2002: 227).

In contrast, the international finance literature posits that portfolio balance models should include both bonds and equities because bond flows are typically hedged, and thus exchange rates are more significantly affected by equity movements, driven by the need for portfolio diversification and heightened rates of return (Brooks *et al.*, 2004). Hence this study uses an empirical model that includes traditional variables, bonds, equities, and country-specific factors to answer two questions: (i) are South Africa's nominal Rand/U.S. Dollar exchange rate movements shaped by bond or equity flows; and (ii), are these factors different before and after the country's financial liberalisation in March 1995? The remainder of this chapter is organised as follows: Section 6.2 reviews the relevant literature; Section 6.3 briefly discusses the empirical approach adopted; Section 6.4 describes the data utilised; Section 6.5 presents and discusses the results of the empirical analysis; and the chapter concludes with a summary of the findings in Section 6.6.

6.2 LITERATURE REVIEW

Following the various crises among emerging countries in the 1990s, it has become increasingly apparent that capital flows can significantly impact exchange rates, and thus traditional models of exchange rates need to take capital flows into account (Brooks *et al.*, 2004). Hau and Rey (2006) were among the first to develop an equilibrium model in which exchange rates, stock prices and capital flows are jointly determined. Their model, and empirical analysis of 17 OECD countries relative to the U.S. Dollar, found that exchange rates and equity prices are almost equally volatile and for some countries, equity return differentials explain up to 30% of the variance in exchange rates. In addition, it is reported that the negative correlations between equity returns and exchange rates become more pronounced after 1990 for countries with higher market capitalisation relative to GDP, which suggests that exchange rate dynamics are associated with the increased development and integration of global equity markets. Brooks *et al.*, (2004) use ordinary least squares to estimate the annual bilateral flows for the Euro and Yen against the U.S. Dollar in order to explore the role that capital flows play in exchange rate developments in the 1990s. The key finding is that although interest rate differentials continue to matter, equity flows may be having an increasingly greater effect on exchange rate movements relative to current account movements. Siourounis (2004) builds on these studies by including various forms of capital flows in an unrestricted VAR approach to investigate the relationship between capital flows and nominal exchange rates in five developed countries. The results show that net purchases of U.S. equities have a significant effect on the British Pound, Deutsche Mark, and Swiss Franc that lasts 10 to 17 months and is associated with an average 10%

currency appreciation in the U.S. Dollar. Furthermore, a positive movement in the equity return differential is associated with a 2% appreciation of the U.S. Dollar and heightened equity inflows.

Literature has also reported that investor order flows shape exchange rate changes through information dissemination and portfolio allocation. Rime (2001) reports that, in relation to the U.S. Dollar, weekly flows significantly explain the Deutsche Mark, British Pound and Swiss Franc exchange rate movements. Evans and Lyons (2002) report that daily inter-dealer order flow explain 60% of daily exchange rate changes for the Deutsche Mark and 40% of the Japanese Yen relative to the U.S. Dollar. In contrast, Wei and Kim (1997) and Cai *et al.*, (2001) show that accounting for the positions of large traders explains currency volatility better than information dissemination or fundamentals. This result is further supported by Hau and Rey (2006) who find significant evidence that movements in exchange rates are shaped by the portfolio rebalancing of institutional investors. Froot and Ramadorai (2002) argue that the difference between these studies can be explained by taking into account the time horizon under consideration. Thus, although equity flows are important for explaining transitory exchange rate deviations, these flows are not significant when attempting to understand the long-run currency movements. Hence they posit that the inclusion of capital flow variables is more useful for exploring short-term excess returns or currency volatility rather than for understanding long-run currency movements.

Studies of South Africa's exchange rate dynamics show that there is an empirical relationship between commodity prices and the Rand exchange rate, and these dynamics have secondary impacts associated with the Dutch Disease literature.⁴⁴ Aron *et al.* (1997), investigates the determinants of the real exchange rate over the period from 1970 to 1995. The results show that fiscal, monetary and exchange rate policies coupled with the real gold price and short-term capital flows significantly shape the country's real exchange rate movements. The results of MacDonald and Ricci's (2004) estimation of the equilibrium path of the country's real effective exchange rate over the period from 1970 to 2002 similarly show that the exchange rate is most significantly affected by commodity prices, as well as by real long-term interest rate differentials, GDP differentials, trade openness, the size of the fiscal balance, and the position of net foreign assets. Thus, both of these studies find that South Africa's real exchange rate is affected by a mix of fundamentals and capital flows. Frankel (2007) investigates the determinants of the nominal and real Rand/U.S. Dollar exchange rate over the period from 1984 to 2007. Once again commodity prices are found to be significant but it is also reported that high domestic interest rates increase international demand for the Rand, leading to a currency appreciation. Hence Frankel notes that in some respects, the South African Rand behaves like the currencies of developed countries. In order to gain a clearer understanding of the direct and

⁴⁴ See Ngandu (2005) for a review of the literature.

indirect commodity price effects, Stokke (2008) studies the impact of a resource boom on the exchange rate over the period from 1970 to 2002. The results show that after a commodity boom, increased public consumption leads to a real exchange rate appreciation and an expansion of the services sector at the expense of the industrial sector. Consequently, Stokke concludes that South Africa has experienced symptoms of Dutch Disease, whereby a resource boom exacerbates deindustrialisation.

6.3 METHODOLOGY

This section describes the empirical methodology used to investigate the determinants of the nominal Rand/U.S. Dollar exchange rate. The two most frequently used methods encountered in the related literature are vector autoregression models, which are frequently used to explore the equilibrium relationships of real exchange rates; and single equation models, which are commonly used to explore the short-term dynamics of nominal exchange rates. Since the focus of this study is on the short-term movements of the nominal Rand/U.S. Dollar exchange rate, the empirical approach adopted is ordinary least squares.

The model includes the fundamental, international finance, and country-specific factors that have been found to be significantly associated with Rand exchange rate movements in the literature. The fundamental factors comprise the equity return differential, real GDP growth differential, and long-term interest rate differential. According to traditional models of exchange rates, the equity return differential and real GDP growth differential are expected to capture the possible exchange rate effects associated with output shocks. Hence following a positive productivity shock, domestic interest rates will rise and the currency will appreciate accompanied by capital inflows, which are driven by the heightened expectations of future profits, equity prices, and investment (Bailey *et al.*, 2001). Likewise, a positive interest rate differential should also have a positive effect on the exchange rate of Rand-based assets and thus on the value of the Rand.

The international finance factors included in this study consist of purchases of equities and bonds by non-residents. The analysis also includes two country-specific factors: a political risk index and the U.S. Dollar price of gold. The political risk index is included to take into account South Africa's historic periods of political instability, which have led to significant capital flight, balance of payment weakness, and exchange rate fluctuations (Ncube and Leape, 2008). The Dollar price of gold is included because previous studies have shown that the Rand can be considered to be a

‘commodity currency’ whereby movements in commodity prices are associated with movements in the Rand exchange rate (MacDonald and Ricci, 2004).

Thus in summary, the empirical model used in this study is based on Brooks *et al.* (2004) but has been augmented by the inclusion of country-specific variables, and can be represented by the following equation:

$$ZAR_USD_t = \alpha_0 + \beta_1 NPS_t + \beta_2 NPB_t + \beta_3 EQ_D_t + \beta_4 RGDPG_D_t + \beta_5 LTI_D_t + \beta_6 PRI_t + \beta_7 GOLDP_t + \varepsilon_t \quad (1)$$

where ZAR_USD is the logarithm of the nominal Rand/U.S. Dollar exchange rate, NPS is the net purchases of shares by non-residents, NPB is the net purchases of bonds by non-residents, EQ_D is the equity return differential, $RGDPG_D$ is the real GDP growth differential, LTI_D is the long-term interest rate differential, PRI is the political risk index, and $GOLDP$ is the logarithm of the U.S. Dollar price of gold.

6.4 DATA DESCRIPTION

Since the 1980’s, South Africa has had three foreign exchange regimes: from 1985 to 1995 the country had a dual exchange rate system consisting of the commercial and financial Rand; from 1995 to 1999, the country had a controlled floating exchange rate; and since 1999, the Rand has been allowed to float freely (Akinboade and Makina, 2006). Thus, for the purposes of examining the relationship between the Rand/U.S. Dollar exchange rate and the explanatory variables in equation (1), March 1995 can be considered to be a significant break-date as this was when international sanctions were officially ended, when the dual exchange rate was unified, and when most domestic capital controls were removed. Hence, the data used in this study covers a full sample period from 1988 to 2007, as well as two sub-samples running from the first quarter of 1988 to the first quarter of 1995, and from the second quarter of 1995 to the end of 2007.⁴⁵ Although a longer sample would be preferable, the start period of this study is limited by the availability of the South African Reserve Bank’s net purchases of shares and bond data, which starts in the first quarter of 1988. Unless otherwise indicated, all of the domestic data was obtained from the South African Reserve Bank and the U.S. data was obtained from the U.S. Federal Reserve Bank.

⁴⁵ The data is graphically presented in Appendix 6-A.

The dependent variable in this study consists of the logarithm of the nominal South African Rand/U.S. Dollar exchange rate (ZAR_USD) measured as the quarterly average of monthly data. The capital flow data consists of net purchases of equities on the Johannesburg Stock Exchange by non-residents (NPS) and net purchases of bonds on the Bond Exchange of South Africa by non-residents (NPB). Both of the capital flow variables are measured in millions of Rands. The fundamental variables include the equity return differential (EQ_D), which was constructed by subtracting the logarithm of the U.S. S&P 500 Composite Index from the logarithm of the South African Johannesburg All-Share Index (the U.S. data was obtained from Datastream and the South African data was obtained from Inet-Bridge); the real GDP growth differential ($RGDPG_D$), which consists of the difference between the 4-quarter percentage changes in seasonally adjusted real GDP growth in South Africa and the U.S.; and the long-term interest rate differential (LTI_D), which consists of the difference between the quarterly South African and U.S. nominal 10-year government bond yields.

Lastly, two country-specific variables are included in this study. The first is a political risk index (PRI), which was obtained by averaging the monthly International Country Risk Guide (ICRG) as produced by the PRS Group. The ICRG political risk index is a comparable measure of a country's political stability that is determined by assessing risk points for the following component factors: government stability, socio-economic conditions, investment profile, internal conflict, external conflict, corruption, military involvement in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. The risk ratings produced range from a high of 100 (least risk) to a low of 0 (highest risk). The second country-specific variable included in this study is the logarithm of the U.S. Dollar price of gold per ounce ($GOLDP$) measured as the quarterly average of monthly data produced by the World Gold Council. Previous studies have captured the effect of commodity prices on the South African exchange rate using either the U.S. Dollar price of gold (for example Aron *et al.*, 1997; Stokke, 2008) or a composite commodity price index (for example MacDonald and Ricci, 2004; Frankel, 2007). However in studies that use a commodity price index, gold comprises a significant portion because South Africa is one of the world's leading gold producers⁴⁶ and thus the gold price rather than a commodity index is used in this study.

⁴⁶ Gold output accounted for over 40% of the country's total commodity exports in the 1990's (Fedderke and Pirouz, 2002).

6.5 EMPIRICAL RESULTS

Before proceeding with the empirical investigation, it is first necessary to understand the degree of integration of the variables. Hence augmented Dickey-Fuller (ADF) (1979, 1981) and Phillips-Perron (PP) (1988) unit root tests were performed on all of the variables in levels and first-differences with a constant.⁴⁷ The lag chosen for inclusion in the ADF test was made on the basis of the Akaike Information Criterion (AIC), starting with a maximum of 4 lags. The results of the unit root tests are presented in Table 6-1 and show that most of the series are I(1) stationary with the exception of net purchases of bonds (*NPB*), which is I(0) stationary. In the case of net purchases of shares (*NPS*), the ADF and PP tests provide conflicting results. According to the ADF test, *NPS* is I(1) stationary but according to the PP test *NPS* is I(0) stationary. Since unit root tests traditionally have low power, a KPSS stationarity test (Kwiatkowski *et al.*, 1992) was undertaken to resolve this disparity and the results found that *NPS* is I(1) stationary. Thus all of the variables are included in the regression equation in first-differences with the exception of *NPB*, which was included in levels.

Table 6-1: Unit Root Test Results

Variable	ADF test with intercept		PP test with intercept	
	I(0)	I(1)	I(0)	I(1)
ZAR_USD	-1.528	-6.597 ***	-1.704	-6.612 ***
<i>Capital Flows:</i>				
NPS	-0.871	-4.438 ***	-3.886 ***	-25.194 ***
NPB	-7.436 ***	-7.261 ***	-7.420 ***	-32.274 ***
<i>Traditional Variables:</i>				
EQ_D	-0.603	-6.244 ***	-0.554	-6.228 ***
RGDPG_D	-1.360	-4.129 ***	-1.808	-5.210 ***
LTI_D	-0.9602	-7.4203 ***	-1.043	-8.822 ***
<i>Country-Specific Variables:</i>				
PRI	-2.236	-7.346 ***	-2.213	-7.257 ***
GoldP	0.671	-2.978 **	0.972	-6.474 ***

The ADF unit root test include a maximum of 4 lags chosen on the basis of the Akaike Information Criterion (AIC). ***, **, and * represent significance at the 1%, 5%, and 10% levels respectively.

Having assessed the stationarity of the variables, the next step of the empirical analysis is to formulate the regression models and test that they are correctly specified. The results of the

⁴⁷ See section 2.4 for a technical description of the unit root and stationarity tests.

diagnostic tests are presented in Table 6-2. The multivariate Box-Pierce/Ljung-Box Q-statistics and Breusch-Godfrey LM-Test statistics show that there is no significant residual serial correlation. In addition, the Jarque-Bera and Breusch-Pagan-Godfrey heteroskedasticity tests show that the residuals are normally distributed and do not exhibit significant heteroskedasticity. Thus, the diagnostic tests indicate that the regression models are correctly specified.

Table 6-2: Regression Diagnostics

Diagnostic:	1988:Q1 - 2007:Q4	1988:Q1 - 1995:Q1	1995:Q2 - 2007:Q4
<i>Q-Statistics:</i>			
Q-Stat (4)	2.104 (0.551)	1.861 (0.602)	2.597 (0.458)
Q-Stat (8)	3.656 (0.818)	4.697 (0.697)	4.063 (0.772)
Q-Stat (12)	8.593 (0.659)	7.848 (0.727)	11.552 (0.398)
Q-Stat (16)	11.320 (0.730)	11.667 (0.704)	12.679 (0.627)
<i>Normality:</i>			
Jarque-Bera	1.203 (0.548)	1.563 (0.458)	1.161 (0.560)
<i>Breusch-Godfrey Serial Correlation LM Test (2):</i>			
F-statistic	0.020 (0.980)	0.336 (0.720)	0.966 (0.391)
Obs*R-squared	0.050 (0.976)	1.328 (0.515)	2.635 (0.268)
<i>Breusch-Pagan-Godfrey Heteroskedasticity Test:</i>			
F-statistic	0.854 (0.579)	1.210 (0.354)	0.781 (0.657)
Obs*R-squared	8.821 (0.549)	11.627 (0.311)	9.233 (0.600)
Scaled explained SS	5.192 (0.878)	2.644 (0.989)	3.337 (0.986)

Diagnostic probabilities are in parentheses.

Table 6-3 summarises the full sample and sub-sample regression results for the Rand/U.S. Dollar exchange rate. In addition to the variables discussed previously, the empirical analysis also included a set of (0,1) dummy variables to compensate for various political and financial shocks.

Table 6-3: Nominal Rand/U.S. Dollar Regression Results

Dependent variable:	1988:Q1 - 2007:Q4		1988:Q1 - 1995:Q1		1995:Q2 - 2007:Q4	
D(ZAR_USD)	Coefficient	t-Statistics	Coefficient	t-Statistics	Coefficient	t-Statistics
C	7.457E-03	1.855 *	8.342E-03	0.671	5.088E-03	0.530
<i>Capital Flows:</i>						
D(NPS)	-7.400E-07	-2.796 ***	-7.610E-06	-4.117 ***	-6.440E-07	-3.049 ***
NPB	2.790E-07	0.681	-2.550E-05	-3.439 ***	3.440E-07	1.004
<i>Traditional Variables:</i>						
D(EQ_D)	5.396E-02	0.736	-7.096E-02	-0.875	1.517E-01	1.778 *
D(RGDPG_D)	1.110E-04	0.055	3.383E-03	2.041 *	-2.583E-03	-0.972
D(LTI_D)	1.110E-02	4.626 ***	9.337E-03	2.979 ***	1.971E-02	7.329 ***
<i>Country-Specific Variables:</i>						
D(PRI)	-6.350E-04	-0.703	2.419E-03	3.021 ***	-1.263E-03	-1.047
D(GOLDP)	-3.408E-01	-3.482 ***	-3.882E-01	-4.089 ***	-1.843E-01	-1.910 *
<i>Dummy Variables and AR Terms:</i>						
DUM1988Q4	-	-	-3.685E-02	-4.202 ***	-	-
DUM1990Q4	-	-	-2.150E-02	-2.652 **	-	-
DUM1991Q2	-	-	4.502E-02	4.549 **	-	-
DUM1998Q4	-6.332E-02	-4.188 ***	-	-	-4.917E-02	-3.509 ***
DUM1999Q1	-	-	-	-	4.337E-02	2.965 ***
DUM2001Q4	5.161E-02	3.339 ***	-	-	4.414E-02	3.532 ***
DUM2002Q2	-5.274E-02	-3.401 ***	-	-	-5.123E-02	-4.252 ***
AR(1)	5.369E-01	4.568 ***	8.034E-01	3.805 ***	7.858E-01	6.034 ***
R-squared	0.637		0.788		0.833	
Adjusted R-squared	0.576		0.632		0.777	
DW-statistic	1.985		1.734		1.990	
Log likelihood	217.251		94.588		147.854	
F-statistic	10.525 ***		5.058 ***		14.924 ***	

***, **, and * represent significance at the 1%, 5% and 10% levels respectively.

According to the full sample results, only the net purchases of shares by non-residents, the long-term interest rate differential and the Dollar price of gold are important for explaining the movements in the Rand/Dollar exchange rate. This suggests that although the Rand can be considered to be a ‘commodity currency,’ fundamentals and equities are also important. However, considering that the full sample encompasses the end of apartheid, the country’s political transition, and financial liberalisation, it is possible that more insight into the country’s exchange rate dynamics can be gained by considering the results pre- and post-1995.

A comparison of the significance of the capital flow coefficients in the first and second sub-samples indicates that the impact of capital inflows on the exchange rate has changed following the

country's financial liberalisation in the second quarter of 1995. The results of the first sub-sample regressions (covering the period from the first quarter of 1988 to the first quarter of 1995) show that both bond and equity flows were significant. However, according to data from the South African Reserve Bank, over this period, total equities recorded an outflow of R8.7 billion, while bonds recorded a total inflow of R9.5 billion. When considered in conjunction with the significance of the political risk index, this provides an indication of the extent to which risk-averse investors favoured hedged bond investments over unhedged equities. This result is in accordance with the 'flight to quality' literature, which notes that investors will move out of equities and into bonds in response to a negative market shock (Gulko, 2002; Hartman *et al.*, 2004). After South Africa's economy democratised and globalised post-1995, equities remained significant, while bonds became insignificant, suggesting that international investors adopted a less risk-averse position and thus shifted their focus from bonds to unhedged equities.⁴⁸

In the first sub-sample, the equity return differential was insignificant while the real GDP growth differential was weakly significant. In the second sub-sample (running from the second quarter of 1995 to the end of 2007), the significance of the coefficients is reversed and the equity differential is weakly significant while the real GDP growth differential is insignificant. This implies that before 1995, a structural improvement in South Africa's productivity led to an increased rate of return on domestic investment, which stimulated investment in bonds. Furthermore, according to Sturges (2000), portfolio managers commonly hedge bond investments in the currency market. Hence the positive coefficient of the long-term interest rate differential suggests that an increase in the long-term interest rate was associated with a positive currency return. In addition, since interest rate differentials tend to dominate inflation expectations, an increase in the domestic long-term interest rate will erode bond returns. According to the Fisher hypothesis (Fisher, 1896), higher future inflation will make fixed investments such as bonds sell for less (Blose, 2010). Likewise, the policy anticipation hypothesis of Smirlock (1986) states that if expected inflation is higher than the central banks outlook, then the central bank will tighten money supply by increasing interest rates. Hence in both cases, inflation expectations result in higher interest rates and falling bond values.

In the post-1995 sample, the sign and significance of the equity return differential coupled with the significance of equity purchases, suggest that a higher equity return differential leads to a domestic currency appreciation due to heightened equity inflows. In addition, the significance of the net purchases of equities, the equity return differential, and the long-term interest rate differential, indicates that in recent years international investors have tended to focus on both excess equity

⁴⁸ Equity purchases during the period from the second quarter of 1995 to the end of 2007 totalled an inflow of R379.6 billion compared to bond purchases of just R5.8 billion.

returns and inflation expectations as equity investments became more desirable than bond investments.

Further insight into these dynamics can also be gained by considering the results of the gold price. Various studies have found that gold is considered to be a hedge against expected inflation during times of economic uncertainty.⁴⁹ This is borne out by the results of the first sub-sample. The highly significant coefficients of bond purchases and the gold price during South Africa's high inflationary environment pre-1995, indicate that risk-averse investors turned to hedged bond investments and gold as traditional stores of wealth while moving out of equities. However, when inflation moderated post-1995, the coefficient of equity investment became significant, while bonds became insignificant and gold becomes only weakly significant as investors were willing to purchase more risky unhedged equities. In addition, the decline in the significance of the gold price post-1995 could also reflect South Africa's falling gold production as a result of rising costs, falling grades, and increased international production (Nattrass, 1995). Hence these results suggest that in the years prior to 1995, the Rand may have been a 'commodity currency'; but after 1995, the exchange rate has been more significantly associated with global equity movements than movements in the U.S. Dollar price of Gold.

6.6 CONCLUSION

In this study, the relationship between the nominal South African Rand/U.S. Dollar exchange rate over the period from 1988 to 2007 was explored using an empirical model that included fundamentals, capital flows, and country-specific factors. The aims of the study were to determine whether South Africa's nominal Rand/U.S. Dollar exchange rate has been shaped more significantly by bond flows or by equity flows, as well as to determine whether these factors are different before and after the country's financial liberalisation in March 1995.

The results show that in the long run, the net purchase of shares on the Johannesburg Stock Exchange (JSE) by non-residents, the long-term interest rate differential, and the Dollar price of gold, significantly explain movements in the Rand/U.S. Dollar exchange rate. This suggests that the exchange rate has been more significantly shaped by equity movements than by bond movements. The results further show that the factors that are associated with the Rand/Dollar exchange rate are different before and after 1995. Prior to 1995, both bond and equity purchases by non-residents, the

⁴⁹ For example see Sherman (1982), Jaffe (1989), Haubrich (1998), Ghosh *et al.* (2004), McCown and Zimmerman (2006), Worthington and Pahlavani (2007).

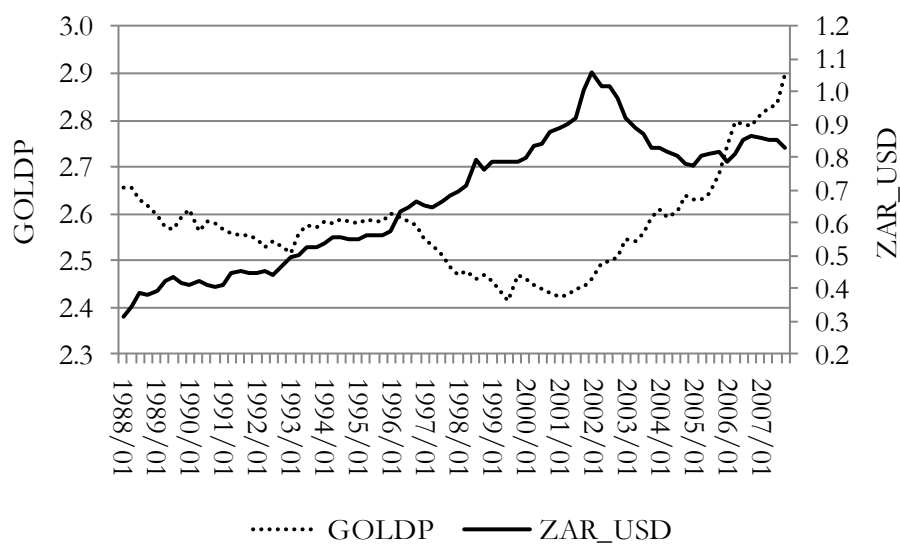
long-term interest rate differential, the political risk index, and the Dollar price of gold were significant. However post-1995, only the net purchases of shares on the JSE by non-residents and the long-term interest rate differential are significant.

Hence these results indicate that before financial liberalisation in March 1995, international investors were more risk averse and thus favoured gold-price driven, hedged bond investments. However, after the country democratised and globalised, investors turned their attention to the excess returns to be obtained from equity investments and consequently the significance of bond investments and the gold price diminished. Thus, these results suggest that the Rand has changed from being a 'commodity currency' in the years before 1995, to being an 'equity currency' after 1995.

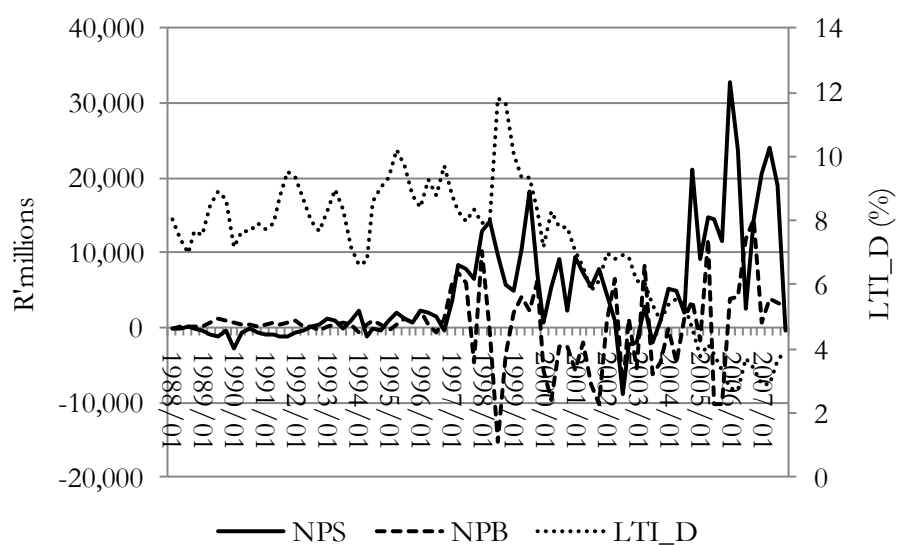
University of Cape Town

APPENDICES

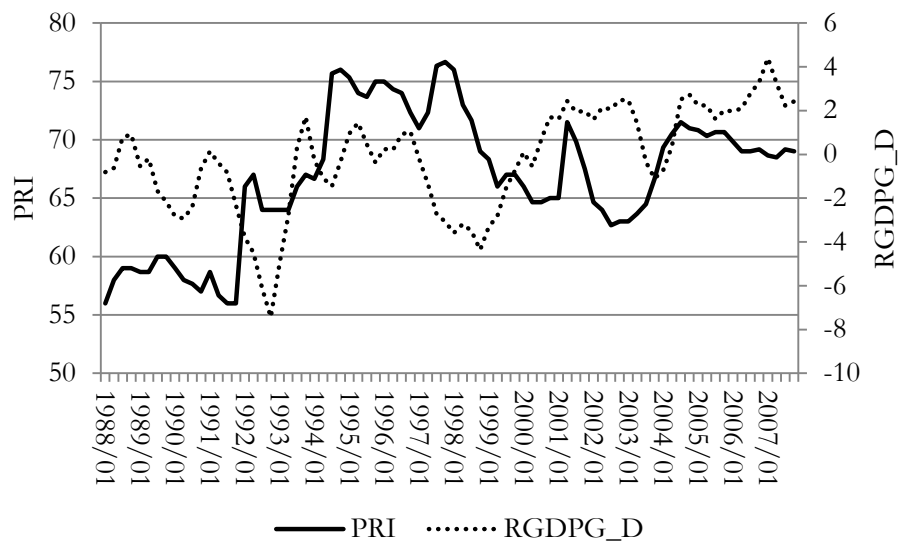
Appendix 6-A: Logarithm of the Rand/U.S. Dollar Exchange Rate and Logarithm of the U.S. Dollar Gold Price



Appendix 6-B: Capital Inflows and Long-Term Interest Rate Differential



Appendix 6-C: Political Risk Index and Real GDP Growth Differential



CHAPTER 7

DRIVERS OF ECONOMIC GROWTH IN SOUTH AFRICA: TRADE, CAPITAL INFLOWS, OR BOTH?

7.1 INTRODUCTION

South Africa has made steady progress in policy reform, from an isolated economy based on import substitution in the 1980's to an export-orientated free-market economy post-1995. As a result, South Africa's export volumes increased from R291.2 billion in 1995 to R492.6 billion in 2007, while import volumes increased from R265.3 billion to R564.0 billion over the same period. However from 2004 to 2007, imports exceeded exports by 6.9% and thus the current account has steadily deteriorated from -1.7% in 1995 to -7.3% in 2007. In addition, domestic savings as a percentage of real GDP declined from 16.5% in 1995 to 14.1% in 2007, while capital inflows increased from R32.4 billion in 1995 to R196.3 billion in 2007. Hence, the country's on-going trade imbalance has been financed by foreign capital inflows, particularly portfolio inflows.

Furthermore, South Africa's rate of economic growth post-liberalisation has been relatively static, and unfortunately insufficient to arrest the country's rising unemployment rate. From 1995 to the end of 2007, economic growth averaged just 3.6%⁵⁰ while unemployment increased from 17.6% to over 26.7% over the same period.⁵¹ Although the reasons for the country's high unemployment rate are varied,⁵² ultimately a high unemployment rate is fundamentally linked to insufficient growth (Rodrik, 2008).

⁵⁰ See Fedderke (2010) for a description of South Africa's economic growth dynamics.

⁵¹ Based on narrow unemployment rate data obtained from Statistics South Africa.

⁵² The reasons commonly cited for the country's high unemployment rate mainly relate to labour market distortions, including labour mispricing and inflexibility (Barker, 2003; Edwards and Golub, 2003; Fedderke, 2005; Burger and Woolard, 2005), labour saving technological change (Fedderke *et al.*, 2003; Dunne and Edwards, 2006), skills market mismatches and sectoral changes of demand (Burger and Woolard, 2005; Pauw *et al.*, 2006; Bhorat and Oosthuizen, 2005; Banerjee *et al.*, 2008), insufficient absorption in the informal sector (Rodrik, 2008), the impact of HIV/AIDS (Arndt and Lewis, 2000, Laubscher *et al.*, 2001; Booysen *et al.*, 2003), and the impact of trade liberalization (Bell and Cattaneo, 1997; Nattrass, 1998; Bhorat, 1999; Birdi *et al.*, 2001).

In recent decades theorists have posited that a country can increase its rate of economic growth through heightened trade in exports (the export-led growth hypothesis) or imports (the import-led growth hypothesis); or through the efficient absorption of capital inflows, particularly FDI (the FDI-led growth hypothesis). According to the export-led growth hypothesis (ELG), the export growth of manufactured goods leads to higher economic growth because of the associated externalities and spillover effects (Bhagwati, 1978; Krueger, 1978; Balassa, 1978; Kavoussi, 1984; Ram, 1987). Hence, in terms of the ELG hypothesis, South Africa's economic growth rate is insufficient to arrest the country's worsening unemployment rate because export growth has not kept pace with the country's developmental needs. However, recent endogenous growth models have argued that economic growth can also be driven by imports of goods and services, which provide firms with access to intermediate factors, foreign technology and knowledge (Grossman and Helpman, 1991; Coe and Helpman, 1995; Lawrence and Weinstein, 1999; Mazumdar, 2002).

In contrast, the capital flow-led growth hypothesis posits that the economic growth rate can be increased by supplementing domestic savings with foreign capital inflows (Reisen, 1998; Mody and Murshid, 2005). The bulk of empirical research on the relationship between capital flows and economic growth has historically focussed on the effects of FDI rather than portfolio flows, mainly because FDI is associated with the benefits arising from fixed investment and heightened export capacity, as well as technological, production, knowledge and organisational spillover effects (De Mello, 1997 and 1999; Borensztein *et al.*, 1998). However, portfolio investment has also been found to enhance economic growth through heightened savings mobilisation and deployment, financial sector development, risk-sharing, and heightened global liquidity (Bailliu, 2000; Soto, 2000; Reisen and Soto, 2001; Ferreira and Laux, 2009). Thus, according to the capital flow-led growth hypothesis, South Africa's lacklustre growth rate is due to insufficient FDI inflows,⁵³ inefficient portfolio spillover effects, or a combination of both.

Hence, these theories raise four important questions for South Africa: (i) is the country's economic growth most significantly associated with trade, capital inflows, or a combination of both; (ii) if economic growth in South Africa is caused by trade, then is exports or imports most significant; (iii) if economic growth in South Africa is caused by capital inflows, then is FDI or portfolio investment most significant; and (iv), is there a causal relationship between the country's trade dynamics and capital inflows? The remainder of this chapter is organised as follows: Section 7.2 briefly reviews the literature; in Section 7.3 the empirical model and methodology are discussed;

⁵³ According to Ahmed *et al.* (2007) and Arvanitis (2006), South Africa only receives a third as much FDI inflows compared with many other emerging countries.

Section 7.4 sets out the data utilised; the empirical results are presented in Section 7.5; and the chapter concludes with a discussion of the key findings in Section 7.6.

7.2 LITERATURE REVIEW

On a theoretical level, exports can enhance economic growth through a variety of channels. McKinnon (1964) argues that exports facilitate increased imports of capital and intermediate goods by relaxing binding foreign exchange constraints. Feder (1983) posits that exports stimulate growth directly via increased levels of labour and capital, as well as indirectly via positive spillover effects to non-export sectors through improved production and management techniques. Helpman and Krugman (1985) report that growth is increasingly related to the comparative advantage derived from economies of scale. Esfahani (1991) argues that exports tend to relieve the import shortages and thus total productivity improves as a result. Lucas (1988), Romer (1986), Grossman and Helpman (1991), and Edwards (1992), posit that exports promote the diffusion of technological innovation through dynamic learning (the ‘endogenous’ growth theory). Baharumshah and Rashid (1999) posits that export growth promotes capital and foreign exchange accumulation, thus facilitating imports of the capital and intermediate inputs necessary for the production of export goods. More recently, Mahadevan (2007) argues that exports encourage better allocation of resources, which then generates dynamic comparative advantage through reduced costs.

However, although the relationship between exports and economic growth has been well explored in the literature,⁵⁴ the results of empirical investigations are mixed. Some cross-country studies have found evidence in support of the ELG hypothesis in developed countries (Marin, 1992), as well as in Africa (Fosu, 1990; Ukpolo, 1994; Njikam, 2003), Latin America (Van den Berg and Schmidt, 1994), Asia (Rahman and Mustafa, 1997; Doganlar and Fisunoglu, 1999; Ekanayake, 1999), and the Middle East (Reizman *et al.*, 1996), while other studies report a predominantly insignificant long-run relationship in Asia (Jin, 1995; Islam, 1998; Shan and Sun, 1998), among the ASEAN countries (Ahmad and Harnhirun, 1996), and the Middle East (Al-Yousif, 1997; Abu-Qarn and Abu-Bader, 2004).

The results of country-specific studies are also mixed. Evidence in favour of the ELG hypothesis has been found in the case of Bangladesh (Begum and Shamsuddin, 1998), Canada (Awokuse, 2003), Chile (Silverstovs and Hertzner, 2006), Ireland, (Stilianos, 2000), Italy (Federici and

⁵⁴ See Giles and William (2000a and 2000b) for a comprehensive review of the export-led growth literature.

Marconi, 2002), Namibia (Jordaan and Eita, 2007), Pakistan (Shirazi and Manap, 2004), Paraguay (Richards, 2001), and Turkey (Taban and Aktar, 2008). In contrast, little evidence is found for Australia (Shan and Sun, 1998; Moosa, 1999; Iyer *et al.*, 2009), Canada (Henriques and Sadorsky, 1996), Columbia (Amin Gutierrez de Pineros and Ferrantino, 1999), and India (Sharma and Panagiotidis, 2003), while bidirectional causality is found for China (Shan and Sun, 1998), Slovenia (Beko, 2003), South Korea (Awokuse, 2005), and Taiwan (Biswal and Dhawan, 1998).

Studies that investigate the ELG hypothesis for South Africa are relatively limited and the results of existing studies are varied. Bahmani-Oskooee and Alse (1993) include South Africa in an analysis of 9 developing countries covering the period from 1973 to 1988. Their results find that for South Africa, the causal relationship between export growth and economic growth is bidirectional. Dutt and Ghosh (1996) include South Africa in an analysis of 26 low, middle, and upper-income countries covering the period from 1953 to 1991. In contrast to Bahmani-Oskooee and Alse (1993), the results find that for South Africa there is no significant causal relationship between exports and economic growth. More recently, Ziramba (2011) examined the causal relationship between South Africa's components of exports (comprising merchandise exports, net gold exports, and exports of services and income receipts) and real GDP over the period from 1960 to 2008. The results of the empirical analysis find that there is evidence of export-led growth only in the case of merchandise exports, while income receipts and service exports have reverse causality, and net gold exports have no causal relationship.

The theoretical relationship between imports and economic growth tends to be more complicated than between exports and economic growth because of the effects of import substitution (Kim *et al.*, 2009). Haddad *et al.* (1996) argues that under perfect competition in a neoclassical model, when trade barriers are removed, factor usage is reduced in the short-run. In the long-run however, industry expands its investment in new technologies and processes and thus becomes more productive, which shifts the industry supply curve to the right. Grossman and Helpman (1991) and Sjoeholm (1999) add that imports that cannot be manufactured domestically will stimulate firms to diversify and specialise, which will have a positive effect on productivity. However, Tybout (2000) posits that under imperfect competition, import-substituting firms will shrink as imports increase, and thus investment and productivity will fall. Kim *et al.* (2009) notes that there can be positive and negative causality running from productivity to imports, because productivity growth will increase economic growth, which in turn stimulates imports. However, in an import-substituting environment, increased productivity could have a negative impact by crowding-out imports from domestic markets.

Empirical studies that investigate the import-led growth hypothesis (ILG) are less plentiful than those that explore the export-led growth hypothesis. Nevertheless, imports have been found to be significantly associated with economic growth in China (Liu *et al.*, 1997), Czech Republic and Poland (Awokuse, 2007), Japan (Lawrence and Weinstein, 1999), Korea (Kim *et al.* 2009), Malaysia (Baharumshah and Rashid, 1999), Mexico (Iskan, 1998), Singapore (Khalid and Cheng, 1997), Thailand (Damooei and Tavakoli, 2006), and the USA (Lawrence, 1999), while bidirectional causality is reported for Nigeria (Deme, 2002) and Turkey (Ugur, 2008).

Although there are no recent studies that explicitly examine the causal relationships between imports and economic growth in South Africa, a selection of studies have investigated the dynamics associated with the country's import demand elasticities. Gumede (2000) examines the country's import performance and demand functions over the period from 1960 to 1996. The results show that 10% change in economic activity increases the demand for imports by 10.6% in the long-run, and by 16% in the short-run. Furthermore, it is found that a 10% increase in economic activity is associated with a 26% increase in the demand for manufacturing imports. Hence, these results show that income drives imports. Edwards and Lawrence, (2008) examine South Africa's trade policy performance over the period from 1962 to 2004. The analysis finds that a 1% increase in gross domestic expenditure stemming from consumption and investment leads to an increase in import volumes of 0.83% and 1.56% respectively. Thus, Edwards and Lawrence note that investment related ILG will have greater balance of payments implications than consumption related ILG. Narayan and Narayan (2010) similarly find that domestic income significantly impacts import demand but concludes that if imports consist largely of the capital inputs needed to generate export-led growth then an appreciation of the currency can alleviate the balance of payments deficit.

However, Goldberg and Klein (1999) argue that in an increasingly globalised financial environment, focussing on trade-led growth without considering the impact of capital flows, especially FDI, can be misleading. Nevertheless, the degree to which FDI affects long-run economic growth is a source of on-going debate. Studies based on the neoclassical approach argue that FDI does not affect the rate of long-run economic growth because it only affects the level of income, not the permanent positive level of technological progress and population growth (Solow, 1957). In contrast, the more recent endogenous growth models argue that FDI can affect long-run economic growth because it facilitates heightened production via the externalities and spillover effects arising from improved human capital organisation and training, from the diffusion of new inputs and technologies, and from heightened capital formation and exports (Romer, 1994; de Mello 1997 and 1999; Borensztein *et al.*, 1998; Stocker, 1999; Greenway and Kneller, 2004). De Gregorio (1992) examines the linkages between FDI and growth in 12 Latin American countries, and reports that

FDI boosted economic growth three times as much as aggregate investment did. Similarly, Blomstrom *et al.* (1994) find evidence of a close association between FDI and growth in their analysis of 78 countries. Ram and Zhang (2002) studied 85 countries using data covering the 1990's and also find evidence in favour of the FDI-led growth hypothesis.

Country-specific studies have reported a causal relationship between FDI and economic growth in the United Kingdom (Blake and Pain, 1994), Portugal (Cabral, 1995), Ireland (Barry and Bradley, 1997), Brazil (Oliveira, 2001), China (Xiaohui *et al.*, 2002), Mexico (Ramirez, 2000), Nigeria (Okodua, 2009), Philippines and Thailand (Bende-Nabende *et al.*, 2003), and Singapore and Taiwan (Ng, 2006). Chowdhury and Mavrotas (2005) report that growth unidirectionally causes FDI in Chile, while in Malaysia and Thailand, FDI and growth share a bidirectional relationship.

However, Carkovic and Levine (2005) argue that many of these studies have not fully taken endogeneity into account and thus they argue that after controlling for country-specific factors, FDI may not have a positive impact on economic growth. This argument is particularly relevant for countries with good economic performance because improved performance may attract further FDI inflows (Ng, 2006). In contrast to studies that find in favour of the FDI-led growth hypothesis, studies that control for endogeneity frequently find that growth drives FDI and not the other way around. Herzer *et al.* (2008) addressed the endogeneity limitations and re-examined the FDI-led growth hypothesis for 28 developing countries on a country-by-country basis. The results show that none of the countries examined have positive unidirectional causality running from FDI to growth. Adams (2009) examines the effect that foreign and domestic investment have on economic growth in Sub-Saharan Africa and finds that domestic investment is more significantly associated with economic growth than FDI, thus negating the FDI-led growth hypothesis for the region. Duttaray *et al.* (2008) examines the causal relationships between FDI and economic growth for 66 developing countries while taking account of the interactions with exports and technological change. The results show that although there is a causal relationship between FDI and economic growth in 29 countries (43.9% of the sample), the transmission mechanisms vary.

Country-specific studies that take endogeneity into account have similarly found that growth leads to FDI rather than vice versa in Brazil (De Mello, 1997), India (Chakraborty and Basu, 2002), Malaysia (Ang, 2008), and South Korea (Ng, 2006), while bidirectional causality has been reported in China (Ng, 2006; Zhang, 1999 and 2002). Furthermore, in cases where the FDI-led growth hypothesis has been established, it is often conditional on country-specific characteristics. Olofsdotter (1998) reports that FDI leads to economic growth in countries that have strong institutional capabilities and efficient bureaucracies. Bengoa and Sanchez-Robles (2003) further find that FDI leads to growth in countries that have a high degree of economic freedom and social

capacity. Furthermore, a portion of the literature has shown that FDI promotes growth more effectively in export-orientated emerging countries that have open trade regimes, suggesting that there is a link between FDI, exports and economic growth (Balasubramanyam *et al.*, 1996; Bhagwati, 1998; De Mello, 1997; Huang, 2004; Ram and Zhang, 2002; Zhang, 2001; Busse and Groizard, 2008).

In addition, the magnitude of FDI's spillover contribution has been shown to be reliant on factors that include the overall business climate (Chamarbagwala *et al.*, 2000), the level of research and development (van Pottelsberghe de la Potterie and Lichtenberg, 2001) and the level of human capital (Borensztein *et al.*, 1998). Hence, these studies show that FDI may promote economic growth directly or via spillover effects; however, the recipient country first needs to have the right economic and financial environment, and must also possess the required technological, institutional and skills capacity.

With regards to South Africa, Esso (2010) investigates the causal relationship between FDI and economic growth in 10 African countries over the period from 1970 to 2007, and reports that there is a causal relationship between FDI and economic growth in Angola, Cote d'Ivoire and Kenya, while growth causes FDI in Liberia and South Africa. Fedderke and Romm (2006) examine the economic growth effects of FDI in South Africa over the period from 1956 to 2003 and in contrast to Esso (2010); report that although FDI tends to crowd-out domestic investment in the short-run, there are positive spillover effects on capital and labour, and thus on economic growth in the long-run. Studies that explore the economic growth enhancing role of portfolio inflows are less common than those exploring FDI. However, it has been noted that economic growth driven by portfolio investment is dependent on a range of domestic factors such as the developmental status of the recipient country's banking sector (Bailliu, 2000; Bonin and Wachtel, 1999), financial sector (Durham, 2004), and the degree of volatility (Goldin and Reinert, 2005). Furthermore, the link between portfolio investment and economic growth is complicated by the dynamic whereby residents of emerging countries typically hold a large portion of their wealth in flight capital. Hence, financial improvements in developed countries tend to result in the repatriation of resources, which could have been used for economic development in the host country (Goldin and Reinert, 2005).⁵⁵ Thus, as in the case of FDI, portfolio investment-led growth is dependent on the recipient country's

⁵⁵ According to Collier *et al.* (2001), 40% of the wealth of residents in Africa and the Middle East is held outside the host countries while for Latin America this proportion is 10%. With regards to South Africa, Mohamed and Finnoff (2004) calculate that between 1980 and 2000, South African flight capital amounted to 6.6% of GDP each year and thus was an impediment to the country's development.

financial and institutional development, as well as on the sentiments of external and resident investors.

7.3 METHODOLOGY

To evaluate the causal interrelationships between economic growth, trade, and capital inflows, the empirical investigation employs a model that incorporates exports, imports, and capital inflows into an aggregate production function (Balassa, 1978):

$$y = F[(L, K); \alpha] \quad (1)$$

where y is real output, L is labour productivity, K is gross fixed capital formation, and α represents the additional factors of exports, imports, direct investment liabilities, and portfolio investment liabilities. Hence, the causal interrelationships between the factors are empirically investigated using the following VAR model:

$$\begin{bmatrix} RGDP_t \\ LP_t \\ GFCF_t \\ Exports_t \\ Imports_t \\ DIL_t \\ PIL_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} RGDP_{t-1} \\ LP_{t-1} \\ GFCF_{t-1} \\ Exports_{t-1} \\ Imports_{t-1} \\ DIL_{t-1} \\ PIL_{t-1} \end{bmatrix} + \dots + A_k \begin{bmatrix} RGDP_{t-k} \\ LP_{t-k} \\ GFCF_{t-k} \\ Exports_{t-k} \\ Imports_{t-k} \\ DIL_{t-k} \\ PIL_{t-k} \end{bmatrix} + \mu_t \quad (2)$$

where $RGDP$ is real GDP, LP is an index of labour productivity, $GFCF$ is real gross fixed capital formation, DIL is direct investment liabilities, PIL is portfolio investment liabilities, A_0 is a vector of constant terms, $A_{t=1, \dots, k}$ are matrices of parameters, k is the number of lags for the VAR, and μ_t is a vector of i.i.d. Gaussian error terms.

After specifying the unrestricted system, the causal relationships among the variables are assessed using Granger's concept of causality (Granger, 1969), which states that there is a significant unidirectional causal relationship between x and y , if lags of x are significant in the equation of $y(t)$,

or a bidirectional causal relationship if lags of x and y are significant in the equations of $y(t)$ and $x(t)$ respectively. However, a general problem that emerges when testing for Granger causality in time-series analysis is the possible existence of stochastic trends in the variables. Sims *et al.* (1990) and Toda and Phillips (1993) report that the traditional F -test and Wald tests used to determine whether the VAR parameters are stable and jointly zero are not valid for $I(1)$ processes because the test statistics do not have standard distributions. In addition, Giles and Mirza (1999) argue that pre-testing for unit roots and cointegration may induce an over-rejection of the non-causal null because unit root and cointegration tests tend to suffer from size distortions.

In order to overcome these shortcomings, Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL) recommend a lag-augmented test for non-causality, which consists of the following steps: first, the optimal number of lags (k) and the maximum order of integration ($d(max)$) of the variables in the level VAR system are determined using information criteria and unit root tests; second, a lag-augmented level VAR system is estimated with a total of $p=[k+d(max)]$ lags so as to guarantee the asymptotic chi-squared distribution of the Wald test statistic; and third, causal inferences are made by applying standard Wald tests to the first k coefficients in the lag-augmented system. Thus, the advantage of the TYDL approach is that the estimation procedure guarantees the asymptotic χ^2 -distribution of the Wald statistic as it is robust to the integration and cointegration properties of the underlying processes.

7.4 DATA DESCRIPTION

The quarterly data utilised in this study was obtained from the South African Reserve Bank and covers the period from South Africa's financial liberalisation in the second quarter of 1995 to the end of 2007.

The classical production variables consist of economic growth, which is measured as seasonally adjusted real GDP ($RGDP$); labour, which is measured as the seasonally adjusted index of labour productivity in the non-agricultural sectors (LP); and capital, which is measured as seasonally adjusted real gross fixed capital formation ($GFCF$). The additional variables consist of seasonally adjusted real exports of goods and services ($Exports$), seasonally adjusted real imports of goods and services ($Imports$), direct investment liabilities (DIL), and portfolio investment liabilities (PIL).

In the case of the capital inflows, both series are rescaled prior to being transformed into logarithmic series as there are negative values in the data. Hence, the first step of transforming the capital inflows entails the use of the following rescaling equation:

$$\ln(CF_t) = CF_t + \left[\text{abs}(\min(CF_{t,\dots,k})) + 1 \right] \quad (3)$$

where CF_t are direct investment liabilities (*DIL*) and portfolio investment liabilities (*PIL*) and $\text{abs}(\min(CF_{t,\dots,k}))$ is the absolute value of the minimum data point measured over the whole sample from time $t=1$ to time $t=k$. In the second step of the transformation, outliers among the capital flow series are corrected using the approach of Contessi *et al.* (2008) whereby the outliers are identified by visual inspection of the data and replaced by the five-year moving average centred on the abnormal quarter.⁵⁶

7.5 EMPIRICAL RESULTS

The first step in implementing the TYDL test is to determine the maximum order of integration ($d(\max)$) of the four variables. This is achieved using the augmented Dickey-Fuller (1979, 1981) (ADF) and Phillips-Perron (1988) (PP) unit root tests.⁵⁷ The results of the unit root tests are presented in Table 7-1 and show that the capital inflows are $I(0)$ stationary, while the other variables are all $I(1)$ stationary. Thus, the unit root tests show that $d(\max) = 1$.

⁵⁶ Data points are considered as outliers only if they last for one quarter and demonstrate the greatest positive or negative magnitude in the series. If outliers are too close together to use a five-year window period, the next window period is used instead. The corrected outliers occur in the second quarter of 2001 for both capital inflows and in the fourth quarter of 2006 for FDI inflows. The transformed capital inflow series are graphically presented in Appendix 7-A.

⁵⁷ See section 2.4 for a technical description of the unit root and stationarity tests.

Table 7-1: Unit Root Test Results

Variable	ADF Test		PP Test	
	I(0)	I(1)	I(0)	I(1)
RGDP	1.701	-3.195 **	2.822	-3.243 **
LP	-0.839	-6.150 ***	-0.871	-8.585 ***
GFCF	1.280	-3.780 ***	2.115	-3.829 ***
Exports	-0.010	-7.386 ***	-1.519	-18.118 ***
Imports	0.848	-6.897 ***	0.848	-6.901 ***
DIL	-3.837 ***	-6.574 ***	-5.120 ***	-21.635 ***
PIL	-4.937 ***	-7.076 ***	-4.915 ***	-24.619 ***

The ADF and PP tests both include a constant. The ADF unit root test include a maximum of 4 lags chosen on the basis of the Akaike Information Criterion (AIC). ***, **, and * represent significance at the 1%, 5%, and 10% level respectively.

In the second step of the TYDL approach, the level VAR model is specified and tested for misspecification using standard diagnostic tests.⁵⁸ The results of the LM-Test statistics summarized in Table 7-2 show that there is no significant residual serial correlation, while the residual heteroskedasticity and normality tests show that the residuals do not suffer from significant heteroskedasticity and are normally distributed. Thus, the diagnostic tests indicate that the empirical model is correctly specified.

Table 7-2: VAR Diagnostics

Lags	Statistic	Prob.
<i>Residual Serial Correlation Tests (LM-Stats.)</i>		
1	47.508	0.534
4	54.133	0.285
8	43.286	0.703
12	42.026	0.750
<i>Residual Heteroskedasticity Tests (Chi-Stats.)</i>		
Joint	403.913	0.993
<i>Residual Normality Tests (Joint Chi-Stats.)</i>		
Skewness	3.990	0.781
Kurtosis	2.714	0.910
Jarque-Bera	6.704	0.946

⁵⁸ The level VAR also include zero-one dummy variables in the first quarter of 1999, the third quarter of 2005, and the fourth quarter of 2006.

The third step of the TYDL approach requires the determination of the optimal lag length (k), which is found to be one lag using the Schwartz (SIC) and Hannan-Quinn Information Criteria (HQ). Thus, having identified $d(max)$ and k , the level VAR is then re-specified with one extra lag and thereafter, standard Wald tests are applied to the first k coefficients in the lag-augmented system.⁵⁹

The results of the TYDL non-causality tests are presented in Table 7-3 below and show overall, that economic growth in South Africa is driven primarily by trade and fixed investment rather than by capital inflows.

Table 7-3: TYDL Non-Causality Test Results

Dependant Variable	Modified Wald Statistics						
	RGDP	LP	GFCF	Exports	Imports	DIL	PIL
RGDP	---	6.174 <i>0.013 **</i>	0.000 <i>0.994</i>	0.343 <i>0.558</i>	0.541 <i>0.462</i>	5.183 <i>0.023 **</i>	0.026 <i>0.872</i>
LP	0.006 <i>0.941</i>	---	1.706 <i>0.192</i>	8.673 <i>0.003 ***</i>	1.703 <i>0.192</i>	3.821 <i>0.051 **</i>	0.750 <i>0.387</i>
GFCF	4.660 <i>0.031 **</i>	0.440 <i>0.507</i>	---	0.009 <i>0.926</i>	4.170 <i>0.041 **</i>	0.503 <i>0.478</i>	2.355 <i>0.125</i>
Exports	4.284 <i>0.039 **</i>	1.196 <i>0.274</i>	17.595 <i>0.000 ***</i>	---	21.978 <i>0.000 ***</i>	0.144 <i>0.704</i>	3.287 <i>0.070 *</i>
Imports	3.953 <i>0.047 **</i>	0.451 <i>0.502</i>	28.991 <i>0.000 ***</i>	0.372 <i>0.542</i>	---	0.001 <i>0.977</i>	0.138 <i>0.711</i>
DIL	2.000 <i>0.157</i>	4.645 <i>0.031 **</i>	0.313 <i>0.576</i>	0.255 <i>0.614</i>	0.410 <i>0.522</i>	---	0.613 <i>0.434</i>
PIL	1.593 <i>0.207</i>	0.469 <i>0.494</i>	1.643 <i>0.200</i>	1.023 <i>0.312</i>	0.992 <i>0.319</i>	0.027 <i>0.868</i>	---

Notes: The $[k + d(max)]$ th order level VAR was estimated with $d(max) = 1$ for the order of integration and lag length selection of $k = 1$. Reported estimates are asymptotic Wald statistics. Values in *italics* are p -values. ***, **, and * represent significance at the 1%, 5%, and 10% level respectively.

On a more detailed level, the finding that gross fixed capital formation leads to economic growth accords with the South African literature (Perkins *et al.*, 2005; Fielding, 1997; Fedderke, 2000) and the international literature (Aschauer 1989; Munnell, 1990a and 1990b; Easterly and Rebelo, 1993; World Bank 1994; Lee *et al.*, 1999; Pereira, 2000; Mitra *et al.*, 2002). Thus, this result suggests that South Africa's sub-optimal economic growth rate is in part related to the country's significant

⁵⁹ The *Eviews 6* software used to conduct the analysis requires that the lag-augmented VAR is first re-specified as a Seemingly Unrelated Regression (SUR) system before the Wald tests can be undertaken.

infrastructure deficit, which arose from the decline in infrastructure investment from the mid-1970s to the early 2000s (Perkins *et al.*, 2005; Bogetic and Fedderke, 2006).

The results also show that South Africa's economic growth is driven by exports and imports, and thus finds in support of both the export and import-led growth hypotheses. In addition, there is a highly significant causal relationship running from exports to imports, which reflects the country's reliance on imports for technological innovation, industrial growth and infrastructure development; financed from the country's exports of precious metals and short-term capital inflows (Marais, 2011: 132). Exports and imports are also found to have a highly significant causal relationship with fixed investment. However, the most significant causality runs from exports and imports to fixed investment, rather than vice versa. Thus, this finding implies that South Africa's infrastructure development is derived from heightened trade activity, rather than trade activity being driven by heightened infrastructure development (although fixed investment does have a moderately significant relationship with imports).

With regards to labour productivity, the results show that there is moderately significant unidirectional causality running from economic growth to labour productivity. Thus, increased economic growth is associated with improved labour productivity. However, despite this result, an increase in economic growth in South Africa may not be associated with significantly lower unemployment, because since the 1990s, the country's level of productivity has been more capital intensive than labour intensive (Edwards and Golub, 2003). Nevertheless, the results do find that there is highly significant unidirectional causal relationship running from labour productivity to exports, which implies that an increase in South Africa's exports could potentially be associated with higher labour productivity. However, as in the case of economic growth, greater exports may not translate into lower unemployment because the almost all of the country's labour-intensive export activities are far removed from the current structure of productivity (Hausmann and Klinger, 2008).

With regards to the capital inflows, the results show that economic growth has a moderately significant causal relationship with FDI, but the causality runs from economic growth to FDI rather than vice versa. Hence this study finds that the FDI-led growth hypothesis does not hold for South Africa, which accords with Ezzo (2010). In addition, it is found that exports have a causal relationship with portfolio inflows (albeit at a weak significance level) rather than with FDI, which suggests that portfolio inflows are more integrated into the country's export-led growth dynamics than FDI. Hence, this result shows that there are spillover effects between exports and portfolio investment, and consequently, the reintroduction of capital controls could have unforeseen impacts on the country's export potential.

Furthermore, the lack of a significant causal relationship between FDI and exports may reflect two structural weaknesses. First, the country's transition from being a primary commodities producer to being an exporter of diverse manufactured goods has been slow (Matthee and Naude, 2007; Hausmann and Klinger, 2008; Edwards and Lawrence, 2008). Second, despite South Africa's concentration in capital-intensive sectors, equity-based FDI transactions⁶⁰ and portfolio investment may be more attractive than fixed investment FDI because of on-going risk-aversion and capital, labour, and trade distortions (Fedderke, 2005). Nevertheless, studies have shown that FDI complements export-led growth⁶¹ and thus South Africa's export potential could be improved if the country focussed on attracting higher levels of fixed investment FDI. In addition, there is a moderately significant bidirectional relationship between labour productivity and FDI, which indicates that FDI does have a positive spillover effect on domestic labour productivity, which in turn attracts more FDI. Thus, this result indicates that South Africa's labour productivity could also improve if the country focusses on attracting a greater proportion of FDI.

7.6 CONCLUSION

According to economic theory, growth in emerging countries can be enhanced through heightened trade in exports (the export-led growth hypothesis) or imports (the import-led growth hypothesis); or through the efficient absorption of capital inflows, particularly FDI (the FDI-led growth hypothesis). In this study, the causal relationships between exports, imports, capital inflows and economic growth in post-liberalised South Africa, were empirically investigated using the Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) non-causality tests.

Overall, the results show that economic growth in South Africa is driven primarily by trade and fixed investment rather than by capital inflows, which suggests that the country's sub-optimal economic growth rate (and thus high unemployment rate) is causally linked to insufficient levels of trade, fixed investment and FDI inflows.⁶² In addition, the results show that South Africa's

⁶⁰ Examples include the Anglo American-De Beers unwinding in 2001, the Barclays Bank-ABSA agreement in 2005, and the Standard Bank-Bank of China transaction in 2007.

⁶¹ See UNCTAD (2003), Enderwick (2005), Dash and Sharma (2011).

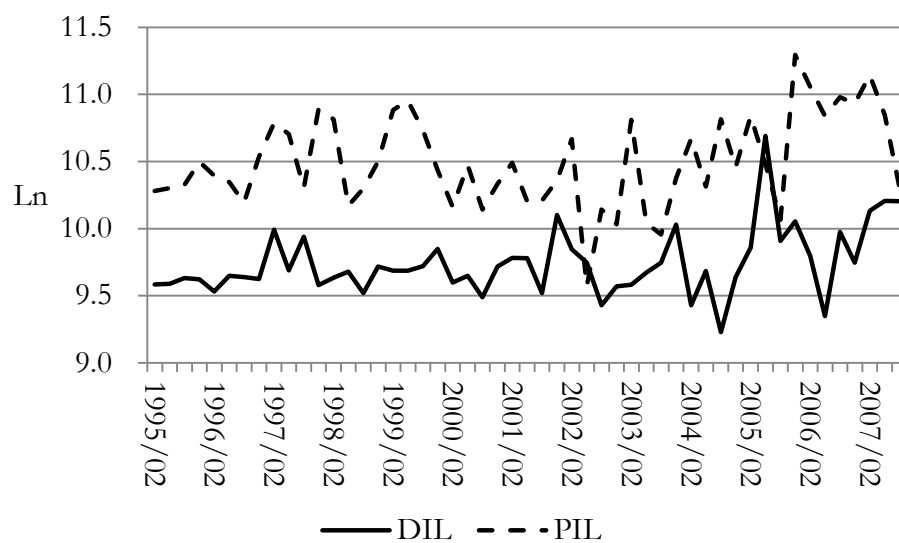
⁶² In the case of the trade factors, Hausmann and Klinger (2008) argue that the reason for South Africa's insufficient export growth is because the country has been slow to adapt its export mix from primary commodities to more sophisticated activities. In addition, Edwards and Lawrence (2008) conclude that the country's weak trade performance has been 'a self-inflicted wound' whereby import substitution policies in the 1970s and 1980s blocked imports and discouraged non-commodity exports. Although there has been growth in non-commodity manufactured exports since the 1990s, volumes have been insufficient to arrest the historic distortions.

infrastructure development is derived from heightened trade activity, rather than *vice versa*. With regards to the capital flows, exports are found to have a causal relationship with portfolio inflows rather than with FDI, which implies that portfolio inflows are more integrated into the country's export-led growth dynamics. In theory, FDI tends to complement export-led growth and thus South Africa's export potential could be improved if the country focussed on attracting higher levels of fixed investment FDI. Furthermore, labour productivity is found to have a bidirectional causal relationship with FDI, suggesting that FDI does have positive spillover effects on domestic labour productivity, which then in turn attracts additional FDI.

Thus three policy implications arise from these results. First, South Africa's economic growth strategies need to integrate the development of the non-commodity manufacturing export sector with related fixed investment programs; second, labour market distortions need to be reduced by improving job skills, and easing labour market conditions; and finally, there needs to be a focus on reducing the impediments that are hampering inflows of fixed investment FDI.

APPENDICES

Appendix 7-A: Rescaled Capital Inflows



CHAPTER 8

CONCLUSION

8.1 INTRODUCTION

Over the last thirty years, empirical literature has shown that global business cycle fluctuations tend to push capital to recipient countries that have attractive domestic (pull) policies. These push-pull dynamics in turn have positive and negative effects on the economies of recipient countries. On the one hand, capital inflows benefit recipient countries through heightened investment and development (Kim and Yang, 2008), while offering source countries new investment and diversification opportunities (Contessi *et al.*, 2008). However, the inflows can also swamp the recipient country's financial system, leading to detrimental effects such as excessive credit extension, debt-fuelled private consumption booms, asset price bubbles; and macroeconomic side-effects, such as inflationary pressure, real exchange rate appreciation, and widening current account deficits.

The use of counter-cyclical fiscal and monetary policies has been advocated as the primary means of counteracting the detrimental effects of strong capital inflows (Lopez-Mejia, 1999). However, the effectiveness of these policy options has been limited by a combination of policy and country-specific factors, as well as by the recipient country's push-pull dynamics, particularly, if the recipient country's inflows are driven to a greater extent by push factors than pull factors because in such a case, policy makers will have little control over the inflows and outflows. In contrast, if the capital flows are driven primarily by pull factors, then policy makers should be able to use policy mechanisms to control the volatility of the inflows and to mitigate possible detrimental impacts (de Vita and Kyaw, 2009). Furthermore, the experiences of many emerging countries have shown that even in countries where the inflows are driven primarily by pull factors, the cyclical relationships between the capital flows and domestic business cycle fluctuations, as well as between the capital flows and fiscal and monetary policies, are often procyclical rather than counter-cyclical (Kaminsky *et al.*, 2004).

In common with emerging countries in Asia and Latin America, South Africa received substantial capital inflows following socio-political and financial liberalisation in the mid-1990s. However, unlike many other emerging countries, the bulk of South Africa's post-liberalisation

inflows have been in the traditionally short-term forms of portfolio and other inflows rather than FDI (Ahmed *et al.*, 2007; Arvanitis, 2006). In the years after liberalisation, the country has relied on capital inflows to finance its current account deficit and to fund economic development.

Hence, empirical evidence was used in this thesis to investigate the extent to which the divergent macroeconomic impacts arising from the capital flow components have complicated, or even rendered impotent, the policy goals of attracting capital inflows on the one hand, and mitigating any significant detrimental impacts on the other. In particular, this thesis has sought to answer six primary research questions: (i) are the capital inflows ‘pushed’ or ‘pulled’; (ii) what is the relationship between the capital flows and domestic business cycle fluctuations; (iii) what is the relationship between the net capital inflows and domestic policies; (iv) what impacts do the capital inflows have on South Africa’s macroeconomy and transmission mechanisms; (v) what impacts do the short-term capital inflows have on the nominal Rand/U.S. Dollar exchange rate; and (vi), is economic growth in South Africa driven by trade, capital inflows, or both? In the following section of this concluding chapter the results of the empirical analysis are summarised on a capital flow component basis, and thereafter, the policy implications are briefly discussed.

8.2 SUMMARY OF FINDINGS

8.2.1 *Foreign Direct Investment*

The push-pull analysis of South Africa’s post-liberalisation capital inflows finds that FDI is primarily ‘pulled’ by domestic factors. On the one hand, this result implies that domestic policy-makers can use policy mechanisms to shape the FDI inflows. However, on the other hand, this result also implies that the country’s limited success in attracting FDI inflows arises from the ineffective implementation of pull factor policies and is thus a ‘self-inflicted wound.’ Furthermore, it is found that the two significant pull factors are money supply and institutional quality, which indicates that FDI investment is concerned with long-run inflation and policy stability.

It is widely accepted that domestic business cycle fluctuations can have a significant impact on pull factors, and in turn on the magnitude of the FDI inflows. Therefore, analysis was conducted to assess the cyclical relationships between FDI and domestic business cycle fluctuations. The results show that FDI inflows are counter-cyclical and proactive, while FDI outflows are procyclical and proactive. In addition, 5-year rolling correlations find that FDI inflows are most significantly procyclical during down-phases of the domestic business cycle, while FDI outflows are most

significantly procyclical during up-phases. However, on a business cycle component basis, the cyclical relationships between FDI inflows and exports and gross fixed investment, are found to be procyclical; while FDI outflows are counter-cyclically associated with exports and household consumption, and procyclically associated with fixed investment. Furthermore, 5-year rolling correlations show that FDI inflows and outflows tend to be procyclical during up-phases for household consumption, while the outflows tend to be more procyclical during down-phases for fixed investment. Hence, although FDI inflows (outflows) are counter-cyclically (procyclically) associated with the overall business cycle, the cyclical associations with the business cycle components of exports, household consumption, and gross fixed investment are less consistent, and instead demonstrate procyclical (counter-cyclical) tendencies. Thus, the country's FDI flows are positively associated with the traditional productivity factors of exports and fixed investment, but are also associated with the short-run consumption expenditure by households.

The finding that FDI inflows are pulled to the country, and have a counter-cyclical relationship with domestic business cycle fluctuations, implies that the cyclical relationships between FDI flows and domestic policies should also be counter-cyclical. Thus, further analysis was conducted to determine whether domestic policy tends to reinforce (procyclical) or offset (counter-cyclical) the cyclical associations between net direct investment and fiscal and monetary policy. With regard to fiscal policy, it was found that the cyclical relationships tend to be counter-cyclical as anticipated. However, on a more detailed basis, net direct investment is found to have no cyclical association with government expenditure, while being counter-cyclically associated with taxation revenues. Hence, South Africa's net direct investment inflows do not significantly increase government receipt of taxation from foreign-owned companies. Furthermore, net direct investment is found to have a counter-cyclical association with the inflation tax, which suggests that foreign investors use the capital movements as an inflation hedge in accordance with Sayek (2009).

With regard to monetary policy, the analysis finds that net direct investment does not have a consistent cyclical relationship, being counter-cyclically associated with credit, procyclically associated with money supply, and having no association with the Treasury bill rate. However, an examination of the impacts of the domestic business cycle phases on the cyclical relationships between net direct investment and policy shows that in the case of both fiscal and monetary policy, the associations with net direct investment tend to be more procyclical during up-phases. Thus, South Africa's FDI flows tend to be counter-cyclically associated with the aggregate business cycle and fiscal policy, but demonstrate increased procyclical associations with the business cycle components and with monetary policy during expansionary phases. Hence, these results suggest that the country's FDI flows may not have the stabilising macroeconomic effects as conventionally

assumed, possibly reflecting the equity-based nature of the country's FDI flows, which take the form of mergers and acquisitions (M&A) rather than 'greenfield' investment (Gelb and Black, 2004).

The examination of the macroeconomic impacts shows that FDI inflows increase GDP and lead to an appreciation of the exchange rate; but also decrease interest rates and prices, and are sterilised by the central bank on a targeted basis. With regard to the transmission mechanisms, FDI has a positive effect on credit card expenditure and on the bond index, but has a negative effect on total credit and mortgage extension, house prices and household consumption expenditure. The positive effect on credit card expenditure coupled with the negative impact on mortgage extensions suggests that although FDI is typically considered to be a long-term investment, the heightened credit transmission arising from FDI inflows to South Africa tends to be short-term. In addition, FDI is found to have a negative effect on total credit extension even though FDI is associated with lower interest rates. This suggests that FDI investment in South Africa is leveraged abroad rather than through domestic credit markets, possibly as a result of the oligopolistic structure and high fees associated with the country's banking sector (Okeahalam, 2001). Hence, the disparity between the intrinsic nature and impact of the country's FDI inflows may reflect the country's well developed financial markets coupled with on-going risk aversion, which shifts the focus of international investors from long-term to short-term time horizons.

The finding that FDI flows have a positive effect on GDP despite only accounting for less than a quarter of South Africa's total capital inflows, suggests that in accordance with the literature (Lim, 2001; Hansen and Rand, 2006), FDI may have a disproportionate impact on the country via spillover effects (De Mello, 1997; Borensztein, *et al.*, 1998). Hence, the relationships between the country's economic growth, exports, imports, and capital flows were assessed to determine whether there is a significant causal association between FDI and economic growth. The results of the empirical analysis show that FDI has a moderately significant causal relationship with economic growth but the causality runs from economic growth to FDI rather than vice versa. In contrast, exports, imports and fixed capital formation are found to lead to economic growth; and thus economic growth in South Africa is associated with the trade-led growth hypothesis to a greater extent than the FDI-led growth hypothesis. This implies that the country's sub-optimal economic growth rate (and thus high unemployment rate) is in part, causally related to insufficient FDI inflows and associated spillover effects.

Thus in summary, the results of the empirical analysis show that although FDI is primarily 'pulled' by domestic factors, the inflows (outflows) have a counter-cyclical (procyclical) relationship with domestic business cycle fluctuations. With regard to policy, FDI has a counter-cyclical relationship with fiscal policy and an inconsistent relationship with monetary policy. An examination

of the macroeconomic impacts shows that FDI inflows increase GDP and lead to an appreciation of the exchange rate; but also decrease interest rates and prices, and are sterilised by the central bank on a targeted basis. With regard to the transmission mechanisms, FDI has a positive effect on credit card expenditure and on the bond index, but has a negative effect on total credit and mortgage extensions, house prices and household consumption expenditure. In addition, trade and fixed investment have a more significant causal relationship with economic growth than FDI, and thus economic growth in South Africa is associated to a greater extent with the trade-led growth hypothesis than with the FDI-led growth hypothesis.

8.2.2 Portfolio Investment

In contrast to the country's FDI flows, the push-pull analysis finds that portfolio flows are impacted by pull factors and to a lesser extent, by push factors as well. Hence, this result suggests that domestic policy mechanisms may only be partially effective in mitigating possible detrimental impacts arising from the portfolio inflows. Furthermore, the significance of foreign output and interest rates indicates that in accordance with the push-pull literature of Calvo *et al.* (1993) and Fernandez-Arias (1996), heightened foreign economic growth and lower foreign interest rates push portfolio investment to South Africa, while the significance of domestic money supply indicates that the capital inflows are pulled by expansionary financial activity.

Furthermore, the finding that the portfolio flows are impacted by pull and push factors, implies that the impact of domestic business cycles may be lessened if South African and international business cycles are out of phase, or reinforced if synchronous. However, analysis of the cyclical relationships between portfolio investment and domestic business cycle fluctuations finds that the association is generally acyclical, and thus domestic business cycle phases do not significantly impact portfolio inflows. In contrast, portfolio outflows are procyclical, which suggests that expansionary phases are associated with heightened capital flight and repatriation. With regard to the business cycle components, portfolio inflows have a procyclical relationship with exports and household consumption, but a counter-cyclical relationship with fixed investment, while the outflows have the opposite associations, implying that portfolio flows are associated with expansionary economic activity.

Traditional Keynesian theory posits that these procyclical associations can be offset by counter-cyclical fiscal and monetary policies. However, analysis of the cyclical relationships between net portfolio inflows and fiscal policy, shows that the associations are acyclical, implying that the bulk of

South Africa's net capital inflows have no cyclical relationship with fiscal policy. In contrast, the cyclical relationships between portfolio inflows and monetary policy are procyclical and lagging. Furthermore, an examination of the impacts of the domestic business cycle phases on the cyclical relationships between the net capital inflows and monetary policy reveals that the associations tend to be more procyclical during up-phases of the business cycle. Hence, these results imply that the bulk of South Africa's net capital inflows are reactive and behave in accordance with the 'when-it-rains-it-pours syndrome' of Kaminsky *et al.* (2004) whereby portfolio investment increases when monetary policy is loosened and decreases when monetary policy is tightened.

Thus, the empirical analysis finds that portfolio inflows are not associated with the overall business cycle or with fiscal policy, but are procyclically associated with exports, household consumption, and monetary policy; while the outflows are procyclically associated with the business cycle. Furthermore, during expansionary phases, rising economic activity stimulates portfolio inflows, as well as heightened repatriation and capital flight. However, fiscal and monetary policy mechanisms are not used to stabilise these dynamics. Thus, the next stage of the empirical analysis was to determine whether portfolio inflows are associated with boom-bust effects.

With regard to the macroeconomic impacts, portfolio inflows are found to increase GDP and lead to an appreciation of the exchange rate, but decrease interest rates and prices, and are sterilised by the central bank on an on-going basis. Considered in combination with previous findings, these results indicate that domestic policymakers use sterilisation to offset the negative effects of the portfolio inflows rather than fiscal and monetary policy mechanisms. With regard to the impacts of the capital inflows on the transmission mechanisms, portfolio inflows have a positive impact on total credit, mortgages, credit card extension, equities, and house prices. Since the bulk of South Africa's capital inflows are in the form of portfolio investment, the finding that these inflows have more of an impact on equities than on bonds, suggests that most of the country's capital inflows enter via the stock market rather than via the bond market, and thus international investors tend to focus on expected stock returns rather than on interest rates when allocating capital to South Africa. Furthermore, the positive effect on credit extension and on asset prices in combination with the macroeconomic effects, suggests that in accordance with the literature (Benjamin *et al.*, 2004; Case *et al.*, 2005; Haurin and Rosenthal, 2005), lower interest rates and portfolio inflow driven credit demand tends to stimulate higher equity and house prices, which can then be used to obtain home equity loans or second mortgages. These in turn are used to reduce short-term debt or increase consumption, thus prolonging the boom so long as interest rates remain level and the inflows continue.

In addition to macroeconomic and transmission effects, portfolio inflows also impact the country's exchange rate dynamics. Prior to liberalisation, the nominal Rand/U.S. Dollar exchange rate was significantly impacted by bond and equity purchases by non-residents, the long-term interest rate differential, the political risk index, and the U.S. Dollar price of gold. However, after liberalisation, only the net purchases of shares on the JSE by non-residents, and the long-term interest rate differential are significant. Hence, before financial liberalisation, international investors were more risk averse and thus favoured gold-price driven, hedged bond investments. However, after the country democratised and globalised, investors turned their attention to the excess returns to be obtained from equity investments, and consequently the significance of bond investments and the gold price diminished. Thus, in tandem with the increased portfolio inflows, the Rand changed from being a 'commodity currency' before liberalisation, to being an 'equity currency' after liberalisation.

The boom-bust dynamics of portfolio flows also have implications for the country's economic growth prospects. Hence, a causality analysis was conducted to examine the inter-relationships among economic growth, exports, imports, and capital inflows. The results show that although economic growth is trade-related more than capital inflow-related, portfolio inflows rather than FDI have a causal relationship with exports. Hence, this finding suggests that portfolio inflows, rather than FDI, are more integrated into the country's export-led growth dynamics.

Thus in summary, the empirical analysis finds that portfolio flows are impacted by pull factors, and to a lesser extent, by push factors as well; which may account for the acyclical (procyclical) relationship between portfolio inflows (outflows) and domestic business cycle fluctuations. With regard to policy, net portfolio inflows do not have a cyclical relationship with fiscal policy, but have a procyclical relationship with monetary policy. The macroeconomic impacts of portfolio inflows include an increase in GDP and an appreciation of the exchange rate, along with a decrease in interest rates and prices. In addition, unlike FDI, portfolio flows are sterilised by the central bank on an on-going basis. Portfolio flows also have positive effects on the transmission mechanisms of credit extension (total credit, mortgages, and credit card extension) and asset prices (equities and house prices). In addition, the analysis finds that as South Africa received substantial portfolio inflows, the Rand changed from being a 'commodity currency' before liberalisation, to being an 'equity currency' after liberalisation. Finally, portfolio inflows are found to have a causal relationship with exports, indicating that portfolio inflows, rather than FDI, are more integrated into the country's export-led growth dynamics.

8.2.3 *Other Investment*

The push-pull analysis finds that other inflows, in common with portfolio inflows, are impacted by pull factors and to a lesser extent, by push factors as well. This indicates that domestic policy mechanisms may only be partially effective in controlling the 'hot' flows and thus mitigating their detrimental impacts. In addition, the significance of foreign interest rates and domestic money supply, suggests that similar to portfolio inflows, other investment inflows are pushed to South Africa by lower foreign interest rates and pulled by domestic price stability. However, the significance of institutional quality indicates that in common with FDI inflows, policy stability is a key factor in attracting other inflows. Furthermore, the analysis shows that institutional quality is even more significant than trade openness, possibly because institutional quality determines the success or failure of financial reforms and thus reflects investor confidence (Demetriades and Andrianova, 2003). Hence, the push-pull analysis suggests that South Africa's short-term capital inflows are pulled by the country's financial sophistication (Fedderke, 2010) and pushed by foreign output and interest rate movements.

As in the case of portfolio inflows, the significance of pull and push factors indicates that the cyclical associations with the business cycle may be dampened or exaggerated depending on the degree of international business cycle synchronisation. However, analysis of the cyclical relationships between other investment and domestic business cycle fluctuations finds that similar to portfolio flows, other inflows are acyclical, while other outflows are procyclical and proactive. Thus, these results show that the domestic business cycle phases do not significantly impact other inflows, while expansionary phases are associated with heightened capital flight and repatriation. In addition, it is found that the cyclical relationships between the other inflows and the business cycle components of exports and gross fixed investment are procyclical, while other outflows are counter-cyclically associated with exports and household consumption. Furthermore, 5-year rolling correlations find that, in contrast to portfolio flows, other inflows and outflows tend to be procyclical during down-phases of the business cycle, which indicates that the other flows tend to exacerbate business cycle downturns. On a business cycle component basis, other inflows and outflows are found to be more procyclical during up-phases for household consumption and fixed investment, suggesting that the debt flows are associated with both short-run and long-run investment.

It is widely accepted that the procyclical business cycle effects can be alleviated by the implementation of counter-cyclical fiscal and monetary policies. With regard to fiscal policy, net other inflows are counter-cyclically associated with government expenditure and procyclically associated with tax revenues. Hence, the debt flows react negatively to higher government

expenditure, but positively to higher tax revenues. This result accords with Burger *et al.* (2012), who find that South Africa's fiscal policy is reactive to the sustainability of interest costs. Furthermore, net other inflows are found to have a counter-cyclical association with the inflation tax, which implies that as in the case of FDI, foreign investors use the capital movements as hedging instruments. In addition, all of the significant cyclical relationships lead the fiscal policy factors, which implies that the net other inflows react proactively to the fiscal policy outlook. With regard to monetary policy, net other inflows are procyclically associated with credit, but are counter-cyclically associated with money supply and the Tbill rate. This suggests that the short-term flows focus on the returns to be gained from heightened private sector credit extension or from rising rates of return. An examination of the impacts of the business cycle phases on the cyclical relationships between the net capital inflows and the policy factors finds that the associations tend to be more procyclical during down-phases of the business cycle. This is possibly because the short-term debt flows are used to smooth the reduction in cash flows.

An analysis of the macroeconomic impacts finds that other inflows do not have a significant long-run impact on GDP, lead to a depreciation of the exchange rate, increase interest rates and prices, and are not sterilised by the central bank. With regard to the impacts on the transmission mechanisms, it is found that other inflows have a positive impact on mortgage extensions, equities, and consumption expenditure, but a negative effect on the bond index and house prices. Thus, these results indicate that the 'hot' capital flows have a positive effect on mortgage extensions, while FDI has a negative effect, which supports the literature that asserts that short-term capital flows are associated with property booms. In addition, the positive effect of other inflows on mortgage extensions coupled with the negative effect on credit card expenditure, suggests that South Africans tend to use property-related access bonds for short-term discretionary spending to a greater extent than credit card facilities. Furthermore, the finding that other inflows have a positive effect on household consumption expenditure, suggests that other inflows are associated with home-equity mortgages rather than with investment property mortgages and thus the effect on house prices is negative while the effect on household consumption is positive. Hence, these results indicate that other inflows have a positive effect on both short-term investment and consumption expenditure, but a negative effect on long-run investment expenditure.

Thus in summary, other inflows, in common with portfolio inflows, are impacted by pull factors and to a lesser extent, by push factors as well. This may account for the acyclical (procyclical) relationship between other inflows (outflows) and domestic business cycle fluctuations. However, unlike portfolio inflows, other inflows have mixed cyclical relationships with fiscal and monetary policies. Furthermore, unlike the macroeconomic effects of FDI and portfolio flows, other inflows

do not have a significant long-run impact on GDP, lead to a depreciation of the exchange rate, increase interest rates and prices, and are not sterilised by the central bank. Finally, regarding the impacts on the transmission mechanisms, it is found that other inflows have a positive impact on short-term investments (mortgage extensions, equities, and consumption expenditure), but negative effects on long-term investments (bonds and house prices).

8.3 POLICY IMPLICATIONS

The push-pull analysis of South Africa's capital flow components finds that FDI is driven by pull factors, while the 'hot' flows are driven by pull and push factors. Hence this suggests that the FDI flows are more responsive to domestic policy mechanisms than portfolio and other flows. Furthermore, considered in combination with South Africa's relatively low proportion of FDI, this finding suggests that the country may be prone to boom-bust cycles driven by the 'hot' flows and the lack of stabilising FDI. The analysis further shows that the most significant factor impacting FDI is trade openness, followed by institutional quality, and then money supply. Hence, increased trade liberalisation, the strengthening of private and public institutions, and price stability, could possibly attract further FDI inflows to South Africa. In addition, the results show that South Africa's FDI inflows do not significantly increase government receipt of taxation from foreign-owned companies, possibly for two reasons. First, South Africa has amongst the highest nominal corporate tax rates of countries with similar FDI attractiveness and does not offer tax incentives for FDI investment (Kransdorff, 2010); and second, South Africa's FDI inflows tend to be equity-based (Arvanitis, 2006), which thus precludes taxation received from the wages associated with capital-intensive FDI. Thus, South Africa could potentially increase the magnitude of FDI inflows by reforming the country's onerous and opaque tax regime to be in line with similar emerging countries, and designing industrial pull policies that will attract a higher proportion of 'greenfield' FDI.

In addition, analysis of the causal relationships between economic growth, trade, and capital flows shows that economic growth in South Africa is driven primarily by trade and fixed investment rather than by capital inflows. Furthermore, exports are found to have a causal relationship with portfolio inflows rather than with FDI, which implies that portfolio inflows are more integrated into the country's export-led growth dynamics. In other emerging countries, FDI has been found to complement export-led growth, which implies that South Africa's export potential could be improved if the country focussed on attracting higher levels of fixed investment FDI. However, doing so would require that policy makers focus on three aspects. First, South Africa's economic

growth strategies will need to integrate the development of the non-commodity manufacturing export sector with related fixed investment programs. Second, labour market distortions will need to be reduced by improving job skills, and easing labour market conditions. Finally, there will need to be a renewed focus on reducing the impediments that are hampering inflows of fixed investment FDI.

Analysis of the cyclical relationships between the capital flows and domestic business cycle fluctuations finds that the capital outflows are more significantly associated with domestic business cycle fluctuations than the capital inflows. This suggests that the regulatory control of capital outflows as implemented in Malaysia, could limit the magnitude of capital flight and repatriation. However, although the capital controls have been found to decrease the volatility of short-term flows (Kaplan and Rodrik, 2001), they have also been found to decrease the volume of flows (Ariyoshi *et al.*, 2000; Inoguchi, 2009), increase stock market volatility (Ali and Espinoza, 2006), and decrease FDI investment due to heightened uncertainty with regards to the ease of repatriating profits (Feldstein, 1999). In addition, the finding that there is a causal relationship between exports and portfolio investment implies that the introduction of capital controls could have unforeseen impacts on South Africa's export potential and economic growth prospects. Hence, in a country such as South Africa, which is still reliant on portfolio flows to finance its current account deficit and economic development, the negative effects of capital controls could have detrimental macroeconomic impacts that could be worse than the effects that the controls are seeking to alleviate.

Instead, the boom-bust dynamics associated with the 'hot' flows can possibly be controlled more successfully through fiscal and monetary policy mechanisms. However, the choice of policy that will minimise the potential risks of capital inflows depends on a variety of factors, such as the permanence or temporary nature of the inflows, the availability and flexibility of the different policy instruments, the nature of domestic financial markets, and the macroeconomic and policy environment of the recipient country (Reinhart and Khan, 1995). Hence Lopez-Mejia (1999) recommends that policy responses should be sequenced, where monetary policy is used in the early stages of the inflows (most commonly in the form of open-market sterilisation), with nominal exchange rate flexibility if the inflows persist. Thereafter, if structural factors drive the inflows, then the focus should shift to fiscal restraint, which would have three beneficial effects: first, damping aggregate demand during periods of higher capital inflows, which could result in lower interest rates and thus moderate capital inflow surges; second, alleviating exchange rate appreciation; and third, fostering counter-cyclical policy responses (Cardarelli *et al.*, 2010).

Over the last decade, South Africa has adopted a free-floating exchange rate regime and steadily built up the central bank reserves required to conduct open market sterilisation (the results of the empirical analysis find that the central bank uses a strategy of targeted sterilisation for FDI and ongoing sterilisation for portfolio investment). Therefore, domestic policies are reasonably placed to deal with the early stages of strong capital inflows. However, the empirical analyses show that the country is not well placed to use policy mechanisms to deal with structural factors driving strong capital inflows.

Furthermore, the use of fiscal restraint as a policy tool to mitigate the macroeconomic impacts of capital inflow surges could prove problematic for three reasons. First, South Africa's post-liberalisation government has been under pressure to improve the livelihoods of the majority of the country's citizens and thus policy priorities have shifted towards restructuring government expenditure towards social upliftment, to the extent that in recent years South Africa has amongst the highest levels of expenditure on social welfare in the world (Fedderke, 2010). Second, South Africa has a low savings rate and thus the country is unable to acquire a fiscal surplus during good times for use during contractions. Third, the empirical analysis shows that the responses between the capital flows and the fiscal policy factors are inconsistent, which suggests that domestic policy makers may have difficulty controlling the different capital flow components using fiscal policy tools.

Hence in theory, monetary policy mechanisms are more viable for controlling the detrimental impacts of capital inflows than fiscal policy. However, South Africa's reliance on procyclical portfolio flows limits the country's ability to use interest rates as a tool to mitigate negative macroeconomic effects, because international investors are chasing high yields and may thus be quick to sell should the rates of return begin to fall (Wesso, 2001). Thus, policymakers are under pressure to maintain a high interest rate differential in order to attract the capital inflows required to fund the current account deficit. Consequently, South Africa has only a limited ability to adopt a neutral policy mix, which consists of tighter fiscal and looser monetary policies, coupled with heightened reserve accumulation (Canales-Kriljenko, 2011).

Thus in summary, the empirical analyses described in this thesis show that although South Africa has been able to use exchange rate flexibility and sterilisation to neutralise the early stages of capital inflows, the divergent characteristics of the country's post-liberalisation capital flow components have limited the fiscal and monetary policy options available to mitigate the detrimental capital flow effects arising from structural factors.

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